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ETHNOGRAPHIC NOTES ON AMERINDIAN AGRICULTURE

R. F. Salisbury, et al

McGill University
Montreal (Quebec)

February 1968

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McGILL UNIVERSITY SAVANNA RESEARCH PROJECT
SAVANNA RESEARCH SERIES No. 9

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Ethnographic
Notes
on Amerindian Agriculture

By

R. F. Salisbury

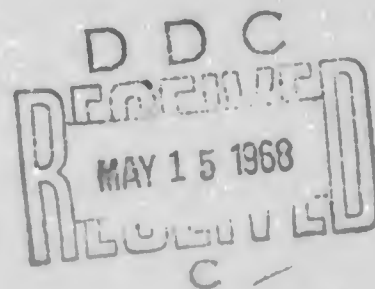
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DEPARTMENT OF GEOGRAPHY
McGILL UNIVERSITY
MONTREAL, P.Q., CANADA

February 1968



Technical Report No. 10

Project NR 387-020-Contract No. Nonr-3855 (00)
OFFICE OF NAVAL RESEARCH, GEOGRAPHY BRANCH

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PREFACE

A report with the title:- "Ethnographic Notes on Amerindian Agriculture" is justified on several grounds. Firstly in an investigation of the nature and origin of the savanna landscape a detailed knowledge of the land-use practices and demography of the inhabitants is essential, especially where the nutrient base of the predominant type of agriculture is the forest either surrounding or distributed within the savanna landscape. Secondly the data and ideas contained in this report are a contribution to the rapidly increasing body of knowledge pertaining to the Amerindians of the Amazon-Guiana drainage divide. Thirdly the Government of Guyana currently has a commission investigating Amerindian lands, and so it is hoped that this report will prove of value in its deliberations.

The field work resulting in these ethnographic notes has ranged over a 3 year period, but this fact should not reduce the value of most of the data contained herein. Appendix III contains the most recent population estimates for the Rupununi. Three of the authors (Salisbury, Hills and Cook), while in the field were associated with the McGill University Savanna Research Project. Salisbury and Hills were also associated with the Centre for Developing-Area Studies of McGill University. J. Dummett was employed by the Department of Agriculture (Government of British Guiana) as an Extension Officer while working with the Amerindians. Hills particularly wishes to acknowledge the contributions made to the activities of the McGill University Savanna Research Project, out of which his contribution developed, by M. Eden (soils and ecology), D. Frost (climate), G. K. Rutherford (soils), N. Sinha (geomorphology) and E. Waddell (cultural geography).

The contributions of Salisbury, Dummett and Cook are independent reports while the Hills contribution is part of a more comprehensive work in progress, which explains the frequent references to broader topics not necessarily pursued in his article.

To those who are particularly interested in the ethnography of the Amerindians of the Rupununi and/or are concerned about the future development of the Amerindians, especially of their agriculture, it should be obvious that further research into all aspects of Amerindian culture is essential. McGill University Savanna Research Project and the Centre for Developing-Area Studies of McGill University plan to continue research in the nature of Amerindian agriculture and on the resource base, economics and demography of Amerindian villages. It is hoped that cooperation with all others interested and concerned, will be possible.

One major problem that will be given attention in the near future is that of 'distance' in agricultural activities. In some villages the distances to fields are considerable, in the case of

Aishalton averaging about 10 miles. Until such time as the quality of cultivation techniques is improved a reasonable level of productivity can only be maintained by bringing virgin forest areas under cultivation, but this means even greater distances to be travelled, perhaps up to 25 to 30 miles for a round trip. Meantime the quality of distance could be improved, by the improvement of roads and tracks, in part by the provision of bridges, and by the provision of one truck per village.

The photographs have been arranged in blocks as most of them are common to all four articles.

For typing, editing and compilation acknowledgements are due to Roland and Dreda Randall, Nancy Beaton and Maureen Card, the latter having to work from some difficult hand-written manuscripts. To them all the Project is extremely grateful.

Theo L. Hills
Director,
McGill University
Savanna Research Project.

ABSTRACT

This report contains four articles analyzing the methods and problems involved in Amerindian agriculture with special reference to the Wapishana tribe. Salisbury is primarily updating earlier works which has become necessary as increased outside influences are felt. These changes are enumerated and their effects on cultivation and settlement described and a future pattern suggested. Dummett examines Amerindian agriculture in order to see what would be the most useful ways of improving the present techniques. All aspects of farming are described, and attempts to cultivate the savanna shown as a future possibility. Hills describes the natural environments of the Wapishana, Macusi and Waiwai tribes and examines the historical relationships of their present locations. The methods of selection of field sites are analyzed and the Amerindian perception of soils in the light of scientific analysis discussed. It is shown that all tribes treat their fields in similar manner despite great differences in soil quality; tradition is thought to be stronger than perception. Cook describes the social life, agriculture and hunting of Sawariwau, a Wapishana village.

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ETHNOGRAPHIC NOTES ON WAPISHANA AGRICULTURE

by

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INTRODUCTION

The techniques of Wapishana agriculture, as practiced some fifty years ago, have been amply described by Roth¹ (1916-17) and Farabee² (1918). The purpose of the present paper is to bring this description up to date, to relate the changes that have taken place to other changes in Wapishana culture, and to provide some quantitative evidence of the degree of equilibrium that existed in their previous forest-fallow agriculture.

The Wapishana are an Arawak-speaking group of people, now numbering between 4,000 and 5,000 individuals, living at the forest-savanna boundary of the Rupununi District of Guyana, south of the Kanuku mountains. They began moving into their present area of settlement from the area of the Serra do Lua of Brazil some hundred years ago, settling amicably within the territory of the Atorai, another Arawak group, and gradually absorbing the latter through intermarriage. The climate of the Rupununi, where 75% of the rainfall of 60-80 inches falls in four months from May to August, means that fields can be cleared and burned only during the dry season, while rapid growth occurs in the wet season. Hunting used to be, and fishing still is, an important source of food, but the major food crop is cassava which can be "stored" through the dry season by being harvested as needed.

CHANGES AFFECTING WAPISHANA AGRICULTURE

There have been several significant changes affecting Wapishana agriculture during the last 50 years. Most important has been the development of cattle ranching both by settlers primarily of European origin and, more recently, by the Wapishana themselves. Incidental to the introduction of cattle has been the improvement of transportation; all families have one or two pack bullocks and about a quarter have bullock carts. The use of bullock carts has grown, together with an improvement in the tracks used, and since about 1948, bicycles have become popular, until now there is an average of 1½ bicycles per household. Settlement has become more concentrated due to missionary activity, the building of schools and, more recently, the provision of wells and wind pumps. In 1924, Farabee³ listed eight hamlets in the Aishalton area, but in 1964, 95 houses were grouped in the two square miles around the church and school, and only eight houses in three outlying settlements. The owners of five of these also had houses in the village (cf Waddell 1963)⁴. Villages have also grown because of the population increase, from 1,700 in 1945 to 4,000 in 1963. For many years the Government has appointed "captains", (commonly known as tushau), for each village, and since 1962, these tushaus have been nominated by elective village councils, to which they are responsible. More diffuse influences have come from the introduction of manufactured goods and money and the development of schooling in English. Before the 1950's, manufactured goods were obtainable

* With some assistance from and data provided by Theo L. Hills.

either in exchange for labour (e.g. as vaqueiros or as balata bleeders), or produce (cassava, farine or corn), sold to the ranches. Now more jobs are available involving travel to the coast (e.g. as teachers); cattle are exported through a marketing agency run in association with the ranchers, and many new foods (e.g. coconuts and tomatoes) are favoured as delicacies by those who have been "outside". Tastes, and the choices available, are widening.

The effects on agriculture of these introductions will be considered under three main headings -- bush fallow cultivation, garden cultivation, and the location of settlements.

I. BUSH FALLOW CULTIVATION

Wapishana classify their land as follows: the two main types are i'barar (savanna) and kanux (forest). Within the savanna one also finds lower'bau (ité palm swamp), ka'badaj (house sites and their satellite vegetation) and katonar ("bush islands" on small hillocks separated from the main forest). Within the forest they differentiate both pidiarni (new growth on derelict fields) and parat'kar (growth on derelict fields that is ready for cutting again) from the real forest. Fields are called zakap.

There was no way of determining when or if the vegetation on derelict house sites justifies being called katonar or "bush island", presumably because no Wapishana sites have had time to so develop within 100 years. Even a known Atorai house site (Kirid'nawa) was referred to as such, though abandoned about 50 years ago, and covered with a bush island about 100 yards in diameter.

Within the forest area, the distinction between newly derelict fields and growth ready for recutting was made by using the following technique. In newly burned fields sample areas 10 yards square were selected and the size of tree stumps estimated and counted. Informants were asked whether they felt the area was ready for cutting or not. All the areas considered "not ready" were in depressions within fields generally considered ready for cutting and to allow for this variation in tree size, two samples were taken from each of these fields, one low down and one higher up. The figures are presented in Table 1, together with a sample from an area of real forest. This area of real forest had an estimated 50 trees over two feet

Sample	Diameter of tree trunks			
	12"+	8-12"	4-8"	2-4"
ready				
1		1	12	12
2		4	6	12
3	1	1	6	18
4		4	5	11
5		4	7	8
6		1	8	18
not ready				
7			9	50
8			9	25
9			16	23
10			13	13
forest				
11	1		7	8

Table 1. Number of trees of varying diameters in 10-yard squares of cleared fields.

in diameter in its three acres, while other gardens rarely had as many as four or five such trees. It did not prove possible to date accurately the previous cultivation of any fields, but hasty tree ring counts indicated an age of between 20 to 40 years for eight-inch trees, while two-foot trees were at least 150 years old.

Reasons for the choice of field sites. The field made in climax forest mentioned in the previous paragraph, is somewhat exceptional in Amerindian agriculture for most other fields are in previously cultivated areas. It was the village field which had been cleared by a work force said to have been made up of 'everyone from Aishalton', but probably of about 30 men, under the direction and encouragement of the tushau. The field was approximately 3½ acres in extent. It took one day to slash down all the creepers, small trees, and underbush, and another day to cut down the large trees. The field was then left for three months to dry before burning. In late March 1964, it had been partially planted with cassava, corn, sugar cane, pineapples, bananas and a few pumpkins. The cassava for planting had been contributed by 'all the women', though the corn seeds had been bought by the tushau with village funds. The cassava was to be harvested and used whenever there was a village work project to provide food for the workers, and the corn was to be sold for village funds, especially to buy nails for building.

The reasons given by the tushau for the clearance of this field in virgin forest were that an individual (in practice this means working with the five or six men who would assist in return for a celebration with cassava beer), could not clear such an area. The village as a whole could. In addition, the continued use of second growth fields had led to a shortened cycle of shifting cultivation, (although it was impossible to say whether or not yields were lower as a result of this shortened cycle), and this field enabled them to add to the number of fields available. Other informants stated that in the forest everything remained moist and the soil was rich, so that a 3½ acre field in climax forest in 1963 was said to have produced 25 bags of corn for sale in addition to a cassava crop. Within possible forest sites, red earth (waja'eme) on slight slopes was considered to be the best for growing as it was 'cool' and stayed wet, while white, sandy soils (katy) were hot and dried out fast. It would be ideal to use forest land, but the labour cost is high and, as it takes three months to dry out 2 foot diameter trees sufficiently for burning, against three weeks for 8 inch diameter trees, it would be difficult to complete the burning and preparation before the rainy season commenced. The normal compromise between high input and high yield is for a person to choose a previously cultivated area where trees are mainly of 8 inch diameter. Sloping terrain and red soil are looked for, but if there is any evidence of acoushi ants, which cut a 6 inch swath through any vegetation, the chosen site tends to be discarded.

In such a "ready" area, a moderate number of medium sized trees can grow some ten feet apart for a long period before they begin to be crowded out by the growth of occasional giants at intervals of about 30 feet. This type of forest, parat'kar, shows up clearly in air photographs [see Photo 1/], as distinct from climax forest, the circular shape of the fields often being distinguishable. For a ground view see Photo. 2.

Parat'kar constitutes the pool of potentially arable land from which Aishalton villagers select their fields. In the 1953 air photographs, it appears to cover 1103 acres. Waddell, (1963)⁴, estimates from these same photographs that 327 acres were under cultivation in 1963; this is in accordance with our own estimate in 1964 that the average household had 2 fields,

each of $1\frac{1}{2}$ acres, under cultivation at one time, and that there were 98 households in Aishalton requiring an area of 392 acres. The population has increased by about one third since 1953. One tenth of the pool of accessible land was cultivated in 1963. As fields are maintained in cultivation for at least two years, (some informants consider that it is easier to keep slashing the suckers which grow from the burned tree stumps for one or two years more, while others prefer to cut new fields after two years), this means that the current population could maintain a rotational balance with a fallow period of up to fifteen years if the population were stable. As the population is in fact now growing at about 3% per annum, despite high (though decreasing) infant mortality rates, and our estimate of the ideal forest regeneration period is 25 years, population pressure would be expected to become serious about 1980 if no new climax forest is brought into the cultivation cycle (see Preface).

Within the suitable areas of parat'kar, an individual Wapishana has a virtually free choice with regards to clearance of a forest area, although he may obtain a second opinion from expert farmers as to whether the land was ready for cultivation. There is a tendency however, for people to clear new fields in the same general area as their former fields, often adjacent to the field cleared the previous year, so that an individual often has two fields together at different stages of growth. The 'general areas' of fields are given names, usually referring to the mountain from which the forest slopes down, or to the stream bed nearby. A particular field area is reached by one or two paths which lead from the village to the forest edge where they fan out into a number of 'roads'. These roads appear to have remained stable for a long time and are well known, especially at the points where they cross ité swamps. The individuals who make fields along the same 'road' tend to be members of one or two lineages (elbian) only, although there seems to be no prohibition on outsiders cutting fields along any particular road, merely a preference for relatives to work together.

Preparation of fields for planting. A fairly common system in clearing fields is to cut partly through many palms and trees, probably those of medium height, and then to select a larger tree and cut it in such a way that it will fall towards those already partly cut through and if this manoeuvre is successful, all the others will be knocked down in the process. One villager claimed that it had taken three days for three men to pile up the logs and brush for the next stage, that of burning.

When fields have been cut and burnt, ideally the half-burned logs should be piled up and burnt again, but the author's observations were that this stage was often omitted. It should be stressed that piling involves three times as much work as the original cutting. The advantages seem to be that a larger area of ground is cleared by removing logs and that rich areas of ash are created under the fires. A more important reason for piling logs would seem to be to make fences to prevent cows from breaking into fields. Only five, out of a total of some 50 fields, had fences and they were all close to the edge of the forest. In one case a genuine fence, with crossed posts at ten foot intervals and four levels of rails had been constructed; in another two fields which had one side open to the savanna, all the logs had been moved to form a massive pile all along the former forest edge. Informants said that cattle could jump over three foot high piles, but denied that deer ever caused much crop damage and they shrugged off the depredations by monkeys of corn planted in the forest. They claimed that, because of cattle, they had given up making fields in bush islands which are separated from the main forest and often close to villages. Air photographs show that this is largely, but not entirely,

the case. However, a few strategically sited short fences at the mouths of roads into the forest are sufficient to protect forest fields.

Crops. The crops planted in a new field are varied. Although manioc is the main crop, planted on all types of soil, sweet potatoes are usually found on slopes, yams and sugar cane in depressions, and cotton in sandy soil. Bananas and shrubs yielding fish-poison are planted in areas of high ash concentration, often along the line of where a fallen tree has completely burned. In smaller areas of ash, or in bonfire sites, pumpkins, pineapples, watermelon, corn, okra, tobacco, and pepper bushes are planted. Pawpaws are common and a few individuals also plant some hill rice. Wild herbs such as those used for brewing cassava beer, are encouraged if they are found growing. All the foregoing can be seen planted when occasional showers start in March and April a month or so before the real rains begin. As soon as the real rains begin, beans and black-eyed peas are planted as well as tomatoes and cucumbers by those sophisticates who have developed a taste for them. Plantains, peanuts and eddoes may also be grown.

By the end of the first year, the annual crops have finished yielding and, from then on, manioc, some sweet potatoes, and the perennial crops, of bananas, sugar cane, pawpaw, peppers, cotton and pineapples, are the almost exclusive crops, the manioc being replanted as areas are harvested. Some replanting of annuals may occur, although corn is never replanted for a second year. A few fields are used for a third year, but these all appear to be relatively close to habitation. As has been indicated, in choosing whether to continue a field for a third year or not, the major issue is whether the work of weeding (principally the slashing down of suckers from burned tree stumps), is easier than the clearing of a new field. It would be expected that secondary growth, in the same way as the growth of crops, would be more vigorous in fields well into the forest. Weeding, therefore, is more of a problem in forest fields.

Some crops continue to grow even in secondary bush, but these crops no longer belong to the person who cleared the field originally, and they may be harvested by anybody at will. It should be added at this point that one of the informants claimed that he had used the same four fields for 27 years.

Attention is usually paid to the regeneration of fields. It is not common to find more than two fields together as a single clearing of three to four acres. Other fields may be cleared along the same "road", but a band of mature trees is left, (perhaps only ten feet wide), between each cleared circle. The pattern of cleared circles, not quite touching at their tangential points, is striking from the air. It recurs in bush islands, many of which are circular, where the band of mature trees forms a tall, but very narrow ring, around either a field or secondary growth with a lower canopy. The virtually annual burning of the sparse savanna grass rarely penetrates beyond this protective ring of the bush islands, although the dense thicket and vine wall where forest meets savanna is burned regularly. However, trees are not left close to cleared fields cut as semicircles at the forest edge. These do not appear to be as common in southern Wapishana territory, where the forest edge does not follow a physical divide as in the north, where the steep slopes of the Kanuku outliers meet the flat Rupununi Plain in a sharp line which coincides with the forest edge. The difference in slopes and soils may be sufficient here to discourage colonization by savanna vegetation.

II GARDEN CULTIVATION

The house sites are distant from the fields, situated on elevated ground often up to six miles from the forest edge. Every house has some form of garden in its immediate neighbourhood, if only some fruit trees such as mango, citrus, and guavas. The Wapishana are keen gardeners of flowers, ornamental shrubs and herbs. A few of the older people use palm trunks, split lengthwise and suspended from trees or the walls of houses, as window boxes for the cultivation of seedlings. Water is brought from long distances for them. More common nowadays is the use of tin cans as flower pots for individual plants, such as mangoes, guavas and citrus, that are not yet large enough for planting out. Any seedling that is planted out must continue to be watered and must be protected from the depredations of pigs, chickens and cattle. Individual plants are securely fenced in most cases, although more occasionally, a small area behind the house, usually to the southwest, downwind and close to the seepage from the latrine pit, is fenced in. This would appear to be an innovation.

Only four houses out of the 98 in Aishalton had such fenced gardens. They all belonged to progressive and generally wealthy individuals, two of whom had European or Coastal Arawak fathers. Two of the gardens consisted entirely of flowers - bougainvillea, frangipani, citrus and irises at this time - although vegetables may have been grown during the rainy seasons. A third owner had two enclosed plots as well as individually protected coconut, soursop, citrus and banana trees. In one area, about ten feet square, peanuts were just sprouting from freshly hoed ground, while on one side was an area of thyme and mint plants. The other area, 15 yards by 17 yards, shared one fence with a cattle corral of the same size, in which were kept six nursing calves, the mothers of which were allowed to graze freely during the day, although they returned to the corral at night. The garden was planted with 255 cassava plants, peanuts (along one fence), 2 prickly pears, 5 beans, 3 tobacco plants and 3 small areas of sweet potato. The garden had been in use for about nine months, and in due course it would be left fallow to be used as a corral while the adjacent corral would become a garden. The fourth garden owner had adopted the same procedure of rotating corral and garden sites. Other crops which could have been grown are cotton, pumpkin and whitey. It should be stated at this point that not all corrals are used as gardens, only some of those within easy reach of the houses.

Yet another area in the village, some 15 yards square, had been fenced with chain-link fencing. It was near the former site of the village pump and it still showed evidence of rectangular beds and irrigation ditches on its lower side. Its cultivation had been a village project; but it had not been a success as the steep slope made it unsuitable for real irrigation. No effort had been made in six months to relocate the garden to utilize the overflow from the new wind-pump, which was being used solely as a pig and duck wallow.

III LOCATION OF SETTLEMENTS

The relationship between settlement and bush islands. Today the most prominent sign of a habitation site is the presence of mango trees, but these are a comparatively recent introduction. The eldest mango found, was one which was brought from Brazil by the grandfather of the present owner, presumably some 70 years ago. The age attributed to this tree seems reasonable in view of the fact that the sizes of its canopy, which is 90 feet, and of its trunk, 54 inches in diameter, equal those of a mango planted in 1917 on Dadanawa ranch in a home

paddock which was well fertilized and had some household drainage nearby. The tree is not approaching senility, although some of its branches have required cutting.

The other trees which are most commonly found around older house sites are cashews, guavas and jamoon trees, with citrus trees being more common by modern houses. These trees are generally located to the southwest of the houses. The houses themselves are sited on the forward northeast slopes of slight hummocks of land in order to raise them above standing water in the wet season and to expose them to the northeast winds, which make the heat bearable in the dry season. The trees which give shade as well as food, are usually planted on the crest of the hummock in order to allow breezes to reach the house. One site, reportedly occupied some 70 years ago, but now a bush island ka'baida 132 yards long and 45 yards wide, was investigated. It was close to Aishalton village. Six large trees formed its main structure, with numerous smaller bushes and undergrowth beneath.

Five trees were in an almost straight line running from the NE corner of the rough ellipse--two old cashews and two jamoon trees some 60 feet high in the first 50 yards, and a jamoon of about 30 feet another 50 yards further on. The sixth tree was a mango, estimated at 40 years of age, offset from the main line of trees and roughly level with the small jamoon. The author considers that this bush island developed initially from the planting of the two cashews and two jamoons some 100 to 150 years ago, in the lee of a house site. As secondary growth occurred on the enriched soil near the houses and under the trees, the smaller jamoon established itself. A separate house-site some 30 yards to the southeast, at right angles to the axis of the growing bush island, led to the planting of the mango, which has subsequently been included within the secondary growth. At present, five houses are scattered in a NE-SW line, parallel to the bush island, and some fifty yards from it. It provides pasture for animals, some fruit, and kindling wood.

A quick survey was made of similar locations, that is the NE slopes of hummocks crowned with trees which stretch away in elliptical form to the southwest, in both the Northern and Southern Rupununi. It was found that, at two sites in the Southern Rupununi, there were no traces of any habitation, but in another three cases, potsherds were discovered on the surface. One of these sites, Kirid'nawa, was reported to have been inhabited some 70 years ago by Atorai-speaking people, at the same time as nearby Aishalton was inhabited by the Wapishana. At this site, surface pottery spread out in a wide fan for some 100 to 150 yards to the northeast of the present fairly large bush island; a stone hoe was found, but no European artifacts. At the other two currently uninhabited sites, European artifacts (china saucer, mug handle, and mirror fragment) were found. At all sites, both Kanuku Plain and Rupununi Plain pottery (Evans and Meggers, 1960)⁵ were found. No collections made were complete enough to enable comparison of percentage frequencies.

At this point, the evidence for settlements in the Southern Rupununi antedating 1800, needs examination in the light of Evans and Meggers 1960 survey of the area. Two points stand out. The sites investigated by Evans and Meggers were predominantly secondary burial sites rather than settlement sites; the areas of the Southern Rupununi they explored were near the Kanuku range, and, as they speculate (p. 329), were probably Macusi (Carib) Indian sites which have recently been taken over by Wapishana and Atorai (Arawak) speaking peoples. Their statement that "choice of the savanna for residence is clearly a post-European phenomenon" (p. 326) may well be true for the Macusi but needs qualification for the Wapishana.

In the northern savannas, the present home of most Macusi, the absence of old trees at habitation sites is most marked, although some twenty to thirty year old mangoes are found. The northeastern slopes of hummocks without trees were inspected here for evidences of habitation. In only two cases out of ten was there any evidence. One was a large bush island of mature cashews near which was a recently abandoned house site with no pottery but tin cans, a bicycle chain cover, broken bottles and an old rubber shoe; the other was a spot where a geographer (M. Eden) had earlier found a fragment of Kanuku Plain but where three of us could find no additional materials. There are relatively few bush islands in the northern savannas (leaving aside the question as to whether the southern bush islands are the result or the cause of habitation further into the savanna), and Macusi living near the Kanuku mountains have readily taken to living and cultivating plots inside the rain climax forest. It may well be that they are indeed basically tropical forest people, and that their savanna settlements are entirely post-European.

The evidence showing that southern settlements are recent is also less than conclusive. Evans and Meggers cite the shallowness of deposits (p. 325), but, as houses are situated on hummocks, they are subject to extreme erosion by surface run off. By inspection of air photographs, it was possible to locate exactly some house-sites inhabited in 1953 in the northern savannas. No lens of adobe clay, modification of vegetation, or pattern of termite hills could be detected to break the regular pattern of broken laterite and concretions on the surface. All traces had vanished in ten years, although at the recently abandoned site mentioned above, some indication of the quantity of clay contained in an oven could be seen. Another effect of the high wet season rainfall is to make Kanuku Plain pottery fragments disintegrate into gritty clay, indistinguishable from weathering laterite, when picked up soaking wet. Therefore, although the harder, but still insufficiently fired, Rupununi Plain ware softens and often splits into layers, there would be a tendency for Rupununi Plain frequencies to appear higher, relative to Kanuku Plain frequencies in older deposits, than they were at the time they were used. The observed infrequency of Rupununi Plain in old deposits would strengthen Evans and Meggers' conclusion that it represents a recent innovation. Under the circumstances, it is surprising that any remains have lasted as long as one hundred years.

Another factor that would tend to obliterate settlement sites is the growth of bush islands themselves which is attested historically for several sites. Surface collection on completely bare weathered laterite is easy; if the sparse grass has not been burnt off it is difficult; within bush islands, it would be extremely difficult, for both excavation and clearance would be required. Yet until this work is done, the question of the origin of bush islands in the south must go unanswered. However, it is clear that fruit tree planting near house sites, and residence several miles from the edge of the main forest but near bush islands, are well-established and internally consistent patterns in the southern savannas especially in the areas where Evans and Meggers did not investigate. The Wapishana, by history and tradition, are latecomers, but they came to an area where other Arawak people with similar gardening techniques were already established. It is difficult to date the arrival of the Atorai. The author thinks that it was probably earlier than the end of the 18th Century as suggested by Evans and Meggers, though not so much earlier as to invalidate the latter's general theory of a late extension of agriculture to the savannas.

Establishment of Bahama grass. A further change in the plant cover near villages, namely the establishment of Bahama grass, is associated with the comparative concentration of livestock, including draft oxen, horses, donkeys, pigs, turkeys, ducks and chickens, near houses. This grass was originally introduced on the European ranches, especially Dadanawa, and in those paddocks where it was initially helped by cultivation and fertilization it has established itself to the exclusion of the tall, but tufty, indigenous grasses. The latter leave areas of bare earth between tufts and so permit the rapid surface runoff and failure to build up a humus cover which is typical of the savanna. By contrast, the Bahama grass forms a mat which retains moisture and organic matter and does not burn as readily as the tall, dry grasses. The Bahama grass has not colonized and spread unaided to areas where indigenous grasses are established.

In a village, it is found chiefly along paths and in areas that have been artificially cleared. This follows from the indigenous practice of keeping some ten yards of land surrounding a house cleared of vegetation and free of rocks and refuse. This is both to give an attractive appearance to the area which the occupant uses, and to diminish the likelihood of grass fires catching the thatch roof of the house. Along the edges of such areas, the Bahama grass can spread and it can colonize the remainder of the area if the house is abandoned. Subsequent deposition of manure and organic refuse builds up the soil, establishes the Bahama grass and provides pasture to further encourage livestock to remain near the dwellings.

CONCLUSION

In several ways then, in settlements in the savanna some distance away from the forest edge, control of tufty grasses and the introduction of Bahama grass can stabilize surface soils, and the intensive use of animal manure and watering can make agriculture feasible on the savanna. It must be emphasized that this change is a slow one. A bush island of an acre was developed in a century; fifteen acres of Bahama grass per village are the result of twenty years exposure to colonization; and permanent gardens of one twentieth of an acre are all that the cattle-holdings of relatively wealthy Wapishana can currently support.

But the changes are cumulative. As the discussion of bush fallow agriculture showed, settlement in the savanna with travel to and from fields in the arc of forest margin was a stable pattern, when associated with deer-hunting, fishing and some small gardening. The attractions of settlement in the savanna have increased over time with cattle-ranching replacing deer-hunting, and the presence of schools, churches and water-pumps adding to the absence of insects as a desirable feature. The introduction of the bicycle, the ox-cart and the pack ox have increased the possible distance between forest margin and settlement, as people, crops and timber can now be carried more easily. The presence of permanent garden sites may, in due course, enable forest margin cultivation to be carried on merely as a reserve procedure to provide staples, and to supplement the labour-intensive dairy-farming and settled horticulture of the villages. The fertility of such garden sites would suggest that already one tenth of the total food supply of the two families concerned comes from their gardens.

The pattern of the future may be one of small concentrated village settlements like islands in the immense sea of arid savanna, relying on ranching on the savanna for their cash income (already Aishalton village earns some \$3,500 BWI per annum from air shipments of beef to the coast, and this amount is kept down only by the limited coastal demand for fresh beef), but virtually self-sufficient for food, with meat, dairy products and vegetables produced with little recourse to the forest itself. The expansion of settlements, and the foundation of new ones at intervals in the twenty-mile gaps between villages, may be able to keep pace with the population increase in the area. The potentialities for the development of this area already exist within the cultural pattern of indigenous Wapishana agriculture. Cattle, Bahama grass, transportation, and wind-pumps will enable these potentialities to be realized.



Photo. 1 Aerial view of parat'kar, the forest growth on derelict fields that is ready for cutting again. The somewhat circular shape of the old fields can be distinguished with a narrow area of primary forest between them. (By permission of the Government of Guyana and Hunting Surveys Ltd.)



Photo. 2 A ground view of parat'kar. There is a dense cover of undergrowth with medium-sized trees about ten feet apart and occasional larger trees at a greater distance.



Photo. 3 Cattle slaughtered at the abbatoir at Lethem, being loaded into a Dakota aircraft for shipment to Georgetown.



Photo. 4 An Amerindian fishing in a savanna stream with bow and arrow, near Marakanata.
(Photo by N.K.P. Sinha)



Photo. 5 A bush-island habitation-site. When these houses become derelict, the bush-island is likely to extend over the richer soils of the houses, gardens and refuse sites.

References Cited in Text

- ¹Roth, W. E. An Introductory Study of the Arts, Crafts and Customs of the Guiana Indians. Smithsonian Institute, Bureau of American Ethnology, 38th Annual Report 1916-1917. Washington, 1924.
- ²Farabee, W. C. The Central Arawaks. University Museum Anthropological Publications, vol. 9. University of Pennsylvania, Philadelphia, 1918.
- ³Farabee, W. C. The Central Caribs. University Museum Anthropological Publications, vol. 10. University of Pennsylvania, Philadelphia, 1924.
- ⁴Waddell, E. The Anthropic Factor in a Savanna Environment. Unpublished M. Sc. Thesis, Department of Geography, McGill University, Montreal, Canada, 1963.
- ⁵Evans, C. and Betty Meggers. Archeological Investigations in British Guiana. Smithsonian Institute, Bureau of American Ethnology, Bulletin 177. Washington, 1960.

NOTES ON AMERINDIAN AGRICULTURE

by

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INTRODUCTION

The purposes of this paper are to examine the techniques of subsistence agriculture as carried out by the Amerindians living in the Rupununi District of southern Guyana, and to suggest possible considerations to be taken into account when attempts are made to impose methods of food production. The pressure of population on available resources is increasing to a serious extent, and it is desirable that some sedentary form of agriculture be developed, together with improved methods of transportation and the opening up of markets for the produce. It is obvious, however, that it is not possible to find one solution only to the problem of improving agriculture in this area. Different solutions must be found to the different situations that exist.

At present, the products of the bitter cassava are the staple of the Amerindian and, as a crop, it is remarkable in many respects. Some of its attributes are: high caloric yield per acre (approximately 4 million calories), drought tolerance, can remain in the ground and be reaped over a period of a year when mature, and will grow in relatively poor soil. Until the Amerindian attempts to produce a variety of crops or tries to develop some more permanent form of agriculture where soil, and possibly, water for irrigation become important, differences in the physical conditions have little effect on the success of cassava as a crop and may possibly have led to an impression that one solution can be found.

TREE CROP CULTURE

The shifting pattern of cultivation in the bush and the infertility of the savanna soils have made tree crop culture a difficult proposition for the Amerindian. The most permanent crop found in the field is a variety of perennial cotton. Around the settlement in the savanna are to be found mango, cashew and the occasional citrus tree. These trees usually struggle for years to be established and only continue to grow due to applications of refuse, nightsoils and animal manure.

LIVESTOCK

Livestock are not reared to any extent and those that exist are not managed in any particular way. The majority of Amerindians that own cattle own no more than one or two, and these are generally used for hauling

a cart or as pack animals. Pigs roam the savanna for their food and alternate between the ité swamp and the cashew groves. The owner usually notches a mark on the ear and then turns the animal free to fend for itself. Periodic checks are made to determine if there has been an increase. If there are young running with a sow, they are marked with the same mark. The more careful rearers will try to bring in a pregnant sow and feed corn to it while confined. When the young reach the weaning stage, they are marked and turned free. In order to kill them, the mature animals are hunted with lasso, shotgun or bow and arrow, which is not always an easy task as pigs have been known to stray more than thirty miles. The rationality of the system is that even if a half or more of the litter dropped is lost, it is worthwhile losing them since the remainder have cost nothing more than time.

Most households have some poultry. Like the pigs, the poultry have to fend for themselves. They are encouraged to stay closer to home and a shed may even be built for them, but it is more common to have the hens nest in the house. Eggs are not generally consumed; the purpose of keeping poultry is for meat consumption only, and so the hens killed first tend to be those who use the nest most frequently. The indigenous methods of rearing small stock, and its implications, must be borne in mind when considering the implementation of any programme in this field.

BUSH FALLOW CULTIVATION

Selection of the Field Site

Selecting a site for a new field is usually done a long time before the cutting season. It may be a good tract of land discovered while hunting, or, more usually an extension of an existing field.

Under the present subsistence system, factors other than soil are more important, although the Amerindian clearly distinguishes poor from better soil. Important factors are the possibility of flooding even under abnormal conditions, for flooding of cassava roots for even a few days will cause damage and, therefore, it is of vital importance to know the levels reached by the highest flood waters; the likelihood of cattle moving into the field (cattle are known to travel considerable distances through the bush and to cause considerable damage to crops); and the presence of acoushi ants. Insurance against the likelihood of damage is one of the factors that influence the Amerindian, in many cases, to have more than one field, with each field in a different location. Difference in soil moisture is recognised as being important for the success of particular crops and is another reason for having fields in more than one location. Crops that require a 'cool' soil are banana, plantain and sugar cane. Although cassava grows well in a 'cool' soil, top growth is heavy in relation to root development and unless topping is practised, it is likely that the roots will be small and there is danger that the plant will be blown over during a strong wind.

Distance from Settlement as a Factor in Amerindian Agriculture

The distance that has to be covered in getting to the field from the village is basic to an examination of Amerindian agriculture. On this factor will depend such others as the effective time spent at the field, the safety and protection of the crop and the maximum amount of produce that can be transported to points of consumption or sale. It has been conjectured that, in earlier periods, Amerindian settlement was more isolated and closer to the bush fringe and that the settlement moved when the field shifted to a distance that could no longer be covered easily from the settlement. Depletion of the bush, followed by soil exhaustion, are usually given as reasons for the moving of the settlement. If it is assumed that a distance of 2 to 3 miles or the distance that could be covered in $\frac{1}{2}$ to $\frac{3}{4}$ hour, is a reasonable upper limit, then it is unlikely that the area of bush circumscribed by the travel distance would ever have been depleted, considering the small area cultivated at any one time and length of time required for bush fallow before an abandoned field could be cultivated.

Since the establishment and consolidation of focal villages, Amerindians have been prepared to forego the convenience of a shorter distance to their fields in preference for 'village life'. Such preference is understandable when it is considered that the effort required to produce subsistence needs is minimal and that there is no incentive to produce more than subsistence amounts. As discussed earlier, the siting of a village in the savanna could not have had as an important consideration the availability, near at hand, of cultivable areas. Today, as the following approximate distances from dwelling to cultivation will show, the distances to the fields are considerable: 6 to 10 miles at Karasabai, Annai, Macusi, Ambrose, Sawariwau, and Aishalton; while at Karaudanawa and Sand Creek distances are generally more than 20 miles. These distances must have an adverse effect on the factors mentioned above. Amerindians do not average more than two visits to their fields and these visits are associated with harvesting food. To associate the distance to cultivation with the frequency of visits is not necessarily to imply that the shorter the distance the more frequent will visits be. It is most probably the case that subsistence production requires no more than this minimal attention, but distance does become an important consideration when attempts are made to change the cultivation system.

Length of stay at the field and consequently effective work done, is affected by distance. In a typical case, departure time, after a meal and after completing chores around the house, would be around 7 a.m. Depending on the season (in the wet season there are usually swamps and swollen creeks to cross), the Amerindian will arrive at the field between 9 and 10 a.m. Work will cease at noon because of the heat. Generally he would eat nothing until he returned home, but sometimes they would bring farine and drink shebe (farine and water) or find a watermelon in the field and eat it. Work will start again by 1:30 to 2:00 p.m. and by 3:30 it would be time to start for home. This schedule can only serve to give a very broad outline as the husband may spend the greater part of the day fishing if there are fish in the area, or his work may be interrupted at any time to pursue game signalled by the barking of his dogs. A rough estimate suggests that the husband spends about 4 hours a week and the wife 6 to 10 hours a week in subsistence cultivation.

There is one period of peak activity for men and that is during the 10 to 15 days when the bush is cleared for a new cultivation. Clearing is done by the extended family (matrimun), and on the basis of reciprocity, each man would spend about 100 hours on this activity. A house is sometimes constructed in the bush and a family will camp here when extra work is required. It is common to find that this house is shared by several families usually those who share in matrimun. The distances involved at Karaudanawa and Sand Creek do not make a daily visit possible. At Sand Creek, groups of villagers will go down together to the area known as Kamarang where they have their fields. They spend about a week there and return with sufficient processed cassava and other food to last three to four weeks. Most villagers at Karaudanawa have houses at Turaraton or at other settlements near the bush. The limiting factor at these settlements is the absence of water during the dry season. The length of stay is, therefore, limited to the amount of water that can be carried from the village.

Distance is important when consideration is given to transportation of produce from the field. This task is assigned to the females of the family. Young women carry loads of up to 100 lbs. while young girls and old women manage relatively lighter loads. These loads are carried by woven reed rucksack (warashi) where the weight is distributed between the neck and back. This type of transportation may be suitable to subsistence cultivation where cassava for the family could be carried on one or two trips a week, but the system breaks down when cash crop production is attempted. Some villagers use carts from the 'bush mouth' at least up to a point where they are stopped by a swamp or creek. Some villages, e.g. Sand Creek and Yupukari, rely on boats during the rainy season.

Shifting Cultivation Cycle

Clearance of field for planting. Having decided the location of the field, the cycle starts with cutting the field. This is usually done after December thus allowing about 8 weeks for drying out before the rains start. Fields are sometimes cut earlier during October or November especially in cases where the cassava would get off to an early start, with the light mid-dry season rains.

The first phase of cutting is to remove the undergrowth by cutting the saplings, low-lying branches, vines, etc. Clearance of the underbrush serves two purposes, to make movement easier for the clearing of the larger trees and to provide 'kindling' for the burning, which is the next stage. After a week or so the large trees are tackled. With many men working in a small area one might consider this a very difficult and dangerous job. The system used diminishes this danger considerably. The trees are not cut right through, enough is left to allow a tree to remain standing. Then a tree larger than the rest, 'a master tree', is cut to fall in such a way that it would bring the others down. When this is completed, the men move out of the area and with luck the trees on which they have been working come crashing down. The best methods of preparing a field include the lopping-off of the branches that stick up after the trees have been felled. The lopping operation should be completed as soon as possible after the felling of the trees, as the work involved increases significantly with the drying of the wood.

Firing is carried out about eight weeks after the field has been cut, just before the leaves fall. A day with a good breeze is chosen and the fire is started at several points on the windward side. The heat is intense for short periods when the flames consume the leaves and small branches of a tree. It is surprising how short a time the fire lasts, a field of about an acre may burn itself out in just about an hour. It would be considered a good burn if the only things left as debris are the trunks, some of the main branches and, of course, the stumps. The best cultivators return to the field in a few days to pile the debris around stumps and large trunks and fire them again. This firing is usually started from the leeward side, as this affords a slower and, consequently, a more efficient burn. With large unburnt trunks criss-crossing the field and the soil covered with ash, the field is ready to be planted.

Planting of crops. Although the list of crops one might find cultivated by Amerindians in the Rupununi is quite extensive (see Appendix I), it is seldom that one finds such variety in any one field. It is more usual to find cassava at all stages of growth, corn, yams, cotton, the odd banana or pawpaw tree and perhaps a few stools of sugar cane.

In discussing subsistence agriculture it must always be borne in mind that this is a system where families produce the food they need, there is little exchange and consequently crop failure may mean starvation. An adequate supply of cassava is therefore the overriding consideration and there must be provision for this. This does not mean that cassava is the first crop to be planted in a newly cut field. As mentioned above, it is general practice to have more than one field and since corn is one of the best recognised cash crops, it is the first crop in the sequence corn - cassava - cassava. This indicates that the Amerindians recognise clearly two agricultural factors: that corn requires a relatively more fertile soil than cassava and that a crop which gives a good cover keeps the weeds down.

Corn is traditionally planted in mounds about 3 feet apart, with 2 to 3 seeds per mound. The crop is planted after the rain begins some time around the end of April or early May. An average yield will be around 1200 lbs. and this will be harvested around October after the ears have been allowed to dry on the stalk. After the corn has been harvested, the stalks are removed, the field weeded and the first crop of cassava planted. Cassava is planted in mounds, each about 4 feet square, approximately 3 to 5 feet apart, with from 4 to 6 sticks per mound. The sticks, selected previous to planting, are bundled and placed against a stump or some such object. The purpose of this is to produce long straight sticks that can be easily carried and are of the best shape for cutting into the straight 9 to 10 inches long lengths that are used in planting. The cassava crop will need about two weeding before it provides a cover that makes any further weeding for that crop unnecessary. When the cassava matures, piecemeal harvesting for food takes place when required. There is no attempt to harvest the entire crop, although this practice would possibly offer greater production from a greater area of land. Cassava is then processed into forms that will stand long periods of storage, but the processing is arduous and time consuming, and this suggests a reason why only a limited amount is harvested at any one time. This system of piecemeal harvesting fits in perfectly with cassava as the main subsistence

crop. Cassava can be harvested from about ten months to eighteen months under normal Rupununi conditions without any adverse effect on the root.

As the crop is harvested, a second crop is planted so that cassava at various ages can be found in the same field and the use of a field often stretches over more than four years, although no more than three crops have been grown. On the poorer soils consisting mostly of coarse sands especially on slopes of around 10%, fertility becomes a limiting factor at the end of two or three years; but on the more fertile flats, for example at Nappi, Kumu, Moco-Moco, the increase in weed population is the main reason leading to abandonment of a field. It is easier to cut a new field than to weed the old one.

Yams are sometimes planted but no particular attention is paid to this crop and it generally suffers severe competition from weeds. Other minor crops are usually planted on the periphery of the field, such as sugar cane, cotton, crauwa (a plant similar to sisal), and pawpaw. The latter is seldom planted, but is allowed to grow after being established from seed dropped by birds. Pumpkins and watermelons are planted between the corn and cassava. Beans are of minor importance if one looks at the area as a whole, but in some villages, Karasabai in particular, a few cultivators will grow a crop of beans every year and will usually have a surplus for sale. Many varieties of beans can be found, but the most common is the brown bean (fejao dohsopa). The bean is planted between the corn after the corn is well established and uses the corn stalk as a runner. Growing beans probably reflects Brazilian influence as the Amerindian does not make any effort to cultivate the crop nor does it have any particular place in his diet.

Abandonment and regeneration. The cycle ends with the intrusion of a high population of weeds which may or may not be accompanied by significant loss of soil fertility. No attempt has been made as yet to determine the length of bush fallow, but there is no evidence to suggest that there is a return to the abandoned field (menab). Since the population pressure has not reached the stage yet where available 'bush' is a factor in determining the length of bush fallow, the major determinant is the ease with which the field can be cleared (menab of less than 12 to 15 years are generally considered to be too dense). In trying to determine the length of a fallow, one may be misled by the age of certain trees in the area, mora and plum trees for example which may be 40 or more years old. The presence of these trees may be due to the fact that they were left standing when previous clearings were carried out because they were considered too difficult to fell with the then existing tools.

CULTIVATION IN THE SAVANNA

The preceding explanation of Amerindian agriculture has been limited to fields in cleared bush areas as this is the most common. There have been, however, a few attempts at cultivating areas of savanna.

Corral culture

The most common practice in cultivating the savanna is what can be called corral culture. This system combines the rearing of cattle with crop production and is usually practised by persons with at least 50 to 60 head of cattle. The animals, or more specifically the cows with their calves, spend the night in a corral and the dung accumulates there throughout the dry season. Before the rainy season begins, the corral is ploughed and planted. This system requires at least two corrals but has proven successful in many locations using different crops. It is the most common way of practising agriculture at Aranaputa near Annai where the coastal settlers plant a variety of crops, including cassava, tobacco and corn. Under this system, improved grasses for weaning calves have been established at Mountain View, and cassava and bananas have been grown for many years at Macusi village. Various ranchers have used the system to produce vegetables for home and sale, and possibly the greatest variety of crops have been grown with success under this system at Karaudanawa. Corral culture can be encouraged on a wider basis, but it does suffer from the limitation that the practitioner must have a fairly high number of cattle and must be prepared to use a fairly intensive method of husbandry both for cattle and for crops.

Cultivation without Accumulation of Manure

There have been attempts to cultivate the savanna without the accumulation of manure. At Karasabai a few persons attempt crops of cassava in gardens around their homes. Although fertility may be improved by sweepings and night soil, yields are undoubtedly poor but this fact might be offset by distant and limited bush areas. Many areas fringing the bush, especially where there are groves of parikaran and sandpaper trees, have been known to support crops of cassava and cotton - a large field was cultivated by an extended family at Macusi village under this condition. The limitation against a more general use of this system is the need for a very secure fence against cattle. The work involved in erecting and maintaining such a fence must be weighed against the work involved in bush cultivation.

An Experiment in Crop Cultivation

In 1963 a trial was set up to test the suitability of using selected savanna areas for crop cultivation at Nappi. An area of one acre was ploughed and fenced and a variety of crops were tried. Initial results showed that good crops of cassava and sesame could be obtained and that Guinea grass (the only available fodder grass at the time) was easily established and grew luxuriantly. Uneconomic yields were obtained from peanuts, beet and corn; pangola grass was established and it spread under the clean field conditions, but the patch was not vigorous enough to resist the regeneration of the typical

species. Upland rice was a complete failure, although this may have been due to late planting.

In 1964, the area was expanded to about four acres to test the establishment of cashew with cassava as a cash-cover crop. Unfortunately, after putting in only two acres, disturbances on the coast brought a close to the project. The Amerindians report reaping a good crop of cassava, but in 1965 no cashew plants could be found. This could have been the result of competition from the very dense savanna grasses that followed the harvested cassava or a combination of competition and fire (if that area of savanna had been burnt). Although the area is still fenced, the Amerindians have not continued cultivation, the reason suggested here is that with present hand tools, clearing and cultivation would require more effort than bush culture.

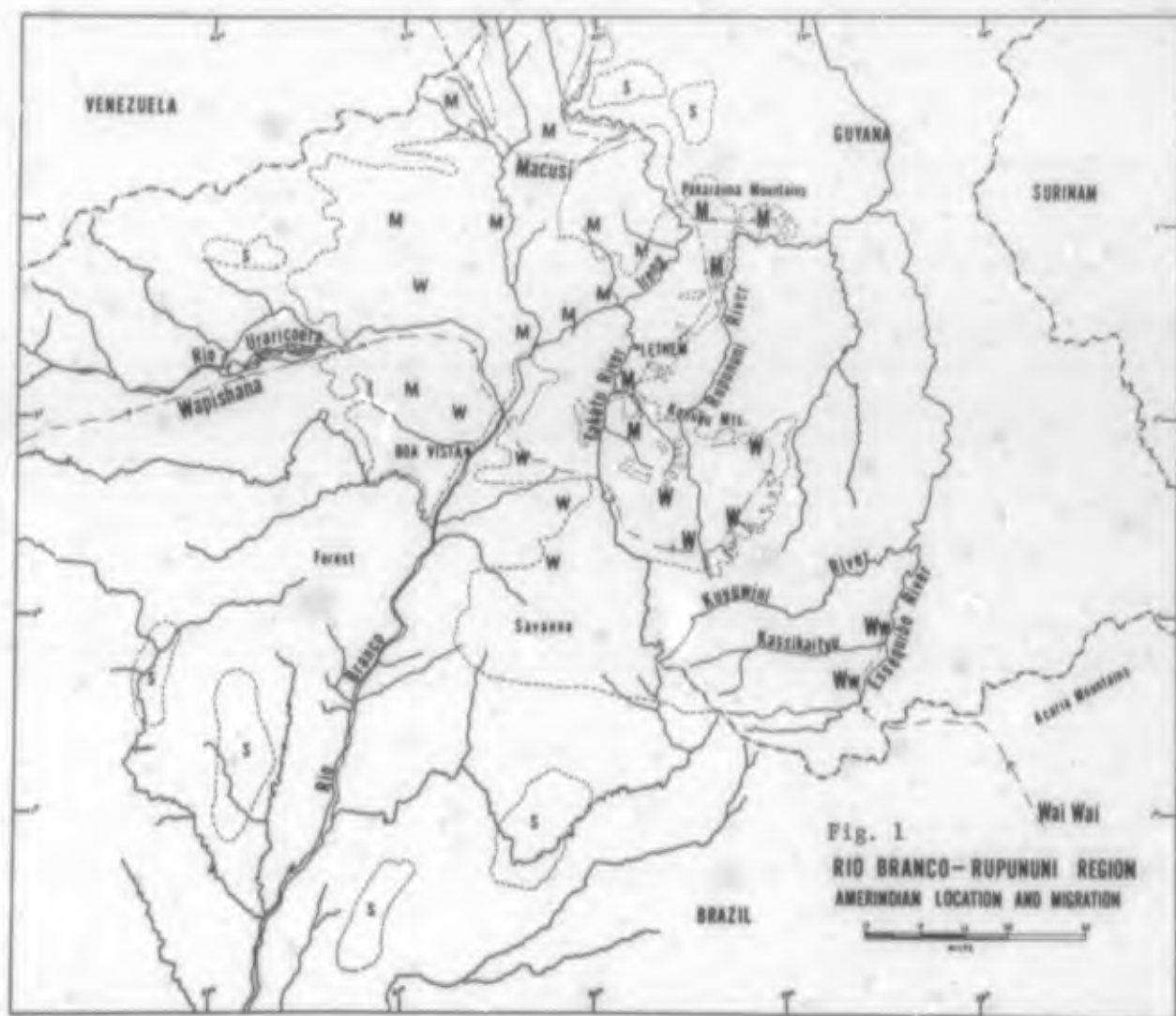


Fig. 1
RIO BRANCO-RUPUNUNI REGION
AMERINDIAN LOCATION AND MIGRATION



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AMERINDIAN AGRICULTURE

by

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INTRODUCTION

Three groups of Amerindians inhabit the Rupununi District of Guyana. The Wapishana, numbering approximately 5,000 are an Arawak-speaking group of people, while the Macusi, numbering approximately 3,000 are a Carib-speaking group as are the Waiwai, a much smaller group numbering only 500. The Wapishana and the Macusi villages are located on the Rupununi savannas primarily within 10 miles of the edge of the forest which they cultivate to a depth of about a mile. The Waiwai are located deep within the forest to the south at about 1° 30' N. (See Figure 1 and Photos 6 and 7).

These three groups are of special interest in the study of the knowledge of, attitude to, and perception of soil because there is considerable evidence to support the belief that the Macusi and Wapishana may have become full-agriculturists only within the last two or three centuries, while the Waiwai may not have reached this stage until even more recently. The agriculture of the Macusi and Wapishana has been observed by the author on a regular basis since 1958, partly with the aid of an excellent air photo coverage in both 1952 and 1962. Knowledge of the agricultural activities of the Waiwai has been gained from the literature, especially the outstanding volumes by a group of Danish anthropologists¹, by discussion with the missionaries working with the Waiwai while at their base at Lethem, Rupununi District; and as a result of a special investigation conducted more recently by R. Dagon.²

The knowledge that a particular group of Amerindians has only recently developed full-agriculture, is useful in that the development of the art can be observed, that is if acculturation due to contact with the non-Amerindian element of the population does not halt or hinder the progress of agriculture. The agriculture of the Macusi, the Wapishana and the Waiwai can perhaps be considered as relatively primitive, though dynamic, and possibly progressing towards a more sophisticated level.³ Long-term observations of the process of change and development in respect to knowledge of and perception of soil should be most rewarding to the social scientist. Rewarding though it may be, the pursuit of such an objective poses many problems. No precise and acceptable methodology for determining the nature and degree of perception.

of an element of the environment as specific as soil has yet been developed and tested to the satisfaction of all interested social scientists, though Conklin has surely gone further in this direction than anybody else.

In the published works on the Amerindians of southern Guyana by Roth⁴, Gillin⁵, Meggers and Evans⁶, and in the thesis by Rivière⁷, there is negligible attention to ethno-ecological characteristics of Amerindian culture. The information that is available has been gained from notes by Dummett⁸, Salisbury⁹ and Dagon¹⁰ and the author's own field observations, and will now be presented within the following framework:

1. The space element -- the locational geography and the natural environment.
2. The time element -- the cultural history of these tribes.
3. Cultural dimensions -- social, technological, and ethno-ecological.

GEOGRAPHICAL LOCATION AND NATURAL ENVIRONMENT

The Rupununi District lies to the south of 5° N. and between the Essequibo River and Brazil. The savannas are restricted to the west and southwest corner of the District and are divided into the northern and southern savannas by the Kanuku Mts. which rise abruptly from the savanna surface in the west and from a forested surface in the east to an average elevation of approximately 3,000 feet. The two areas combined total approximately 5,000 square miles, though they are in fact merely an appendage of a much larger savanna landscape totaling some 21,000 square miles, which lies astride the political boundary separating Guyana from Brazil, and will be referred to for the purpose of convenience as the Rio Branco-Rupununi savannas. The Rio Branco section -- by far the larger of the two -- lies within the Território do Roraimo, one of the federal territories of the state of Amazona, Brazil, and which in physical and biological descriptions of the Amazon is frequently referred to as the Alto Rio Branco. This savanna landscape, with its surrounding tropical rain forest, is one of many located within and around the periphery of the Amazonian basin which are beginning to appear more frequently and accurately on maps of the region. Today the region is reached from Georgetown or Manaus by air, while in the past transportation was primarily via the Essequibo and Rupununi Rivers from the coast of Guyana, or via the Amazon, the Rio Branco and the Takutu, from Brazil. The routeway provided by the Essequibo, its tributary the Rupununi, the low 320 foot divide within the northern Rupununi, the Ireng, the Takutu and the Rio Branco, provide the lowest pass through the whole of the Guiana Highlands, from the Amazonian Basin to the Atlantic Ocean. The divide between drainage to the Guyana coast and into the Amazon is so low and flat that at times at the height of the rainy season the waters of the two drainage basins actually coalesce. Within the Amazonian drainage basin, the 1500 miles from

the mouth of the Amazon to this divide can be travelled by boat with the exception of one series of falls and rapids below Boa Vista. A series of illustrations of the landscapes and characteristics of the landscapes described above and in the ensuing paragraphs is to be found in Photos 8, 9, 10 and 11.

The Rio Branco-Rupununi landscape lies at a general level of 300 to 500 feet above sea level and rises somewhat towards the marginal watersheds. Much of the landscape is characterised by an undulating plain of monotonous appearance, within which isolated peaks and low ridges occasionally rise to view above the riparian forest along meandering rivers and streams. Encircling this plain, though occurring discontinuously, is an area of more elevated terrain, between 140 and 700 feet above sea level, composed of undulating gravel ridges, largely of lateritic origin, lateritic plateau remnants, long gentle sheet wash slopes and, more particularly in the southeast, the remnants of granitic ridges. The landscape as a whole is enclosed by a series of mountain ranges and elevated surfaces which rise 1500 to 4000 feet on their flanks and are arranged in such a way as to produce a basin-like relief with the southern rim of the basin lower and less continuous. The physiographic margin is interrupted by the two broad drainage outlets, to the northeast, the Rupununi River and to the southwest, the broad alluvial valley of the Rio Branco. Structurally the Rio Branco-Rupununi savannas belong to the Guiana Shield, an ancient pre-Cambrian mass that forms the nucleus of the north-eastern part of South America.

Flying southwest from Georgetown across the forested areas of the coastal lowland and then the Pakaraima Mts. which to the north of the Rupununi average 4000 to 5000 feet in elevation, descent is sudden and most dramatic; the dark green of the rain forest and the steep slopes of the Pakaraimas give way with striking abruptness to the dominantly grassy savanna cover of the flat to undulating plain. The broad sweep of the savanna is broken only by the riparian forest along the drainage channels, isolated bush islands and the fringing palms of the swampy depressions. To the east of the Rupununi River at the foot of the Kanuku Mts. and to the far south, the rain forest takes over again with a suddenness that is difficult to explain in purely climatic, pedological or edaphic terms. Man, his fire, and grazing animals have no doubt been the accompaniment of the plain and have helped to restrict the forest largely to the mountain slopes.

The forest surrounding the savanna landscape is in part typical Amazonian rain forest, in part forest that has been described variously as dry-evergreen, deciduous, monsoon, semi-deciduous or montane. Within the savanna landscape, various vegetation types can be distinguished: riparian or galeria forest, bush islands, ité swamps, marshes, aquatic vegetation, muri scrub, and savanna. The savanna varies from sedge-dominant to grass-dominant and areas where woody species form a canopy of almost 50%.

A dominant feature of the Rupununi landscape is, of course, the climate which is typically humid tropical, though characterised by a distinctive dry season which varies in length from 4 to 7 months. It is much longer in the heart of the northern Rupununi than it is in the southeast of the southern savannas. The annual total fall varies from 50 to 80 inches with the lower total being typical of locations in the lee of both the Pakaraima and Kanuku Mts., while the higher totals are typical of locations to the south and southwest. The rainy season extends from approximately the end of April to September. The combination of the concentration of rainfall in the rainy season, approximately 80% or more falling in the period April to September, and the senile nature of much of the lowland landscape, result in severe restrictions being placed upon ground water drainage both in the savanna and in much of the surrounding lowland forest. This means that extensive flooding and waterlogging occur in all low-lying areas. In more elevated areas conditions are less extreme but even here ground water levels frequently rise close to the surface. With the slackening of rainfall, however, towards the end of the rainy season, much of the surface flood water rapidly disperses and is accompanied by regional lowering of river levels. An increased ground water gradient is thus established and ground water drainage is accelerated. This process is greatly facilitated by the appearance of porous and gravel substrata, both in the low-lying fluvial, lacustrine trough and in the more elevated areas to the south and east. In a few places where ground water drainage is impeded by heavy textured horizons, ponds and lakes may persist for several months but there is at this time (the dry season) no general profile impediment and ground water levels fall fairly rapidly with the lowering of the rivers. Thus, in addition to the climatic seasonality it is apparent that the hydrological imbalance across the watershed region contributes to this seasonal contrast of the savanna and surrounding forest landscape (See Photos 12 and 13).

In a consideration of the soil factor in the physical and biological environment of the Rio Branco-Rupununi region, it is essential that soils over the entire region be considered, not only those in the present zone of shifting cultivation. The bulk of the parent material of the soils of the region has been derived from the granitic and gneissic rocks of the crystalline pre-Cambrian mass of the Guiana Shield that surrounds the greater part of the region under discussion. The Rio Branco, the northern Rupununi and the southern Rupununi are lowland regions within the Guiana Shield and are basins of accumulation, although today the greater part of the savanna surface of the southern Rupununi is in the process of degradation. The southern Rupununi is underlain primarily by crystalline basement rocks which rise above the present erosion surface in the form of inselberg-like impressions to heights from a few hundred feet to several thousand feet, while the northern Rupununi savannas are underlain by sediments derived almost entirely from the surrounding shield rocks. Basement and sediments alike yield very poor soils

and profiles are extremely leached and intensively weathered. Development of clay in the subsoil is slight and moisture retention properties are low. In general it can be said of nearly all the savanna soils, as well as most of the forest soils, that they are acid and extremely low in natural fertility and organic matter, in nutrient and in water holding capacity. Three principal groups of soils are to be found. On the more elevated and undulating terrain, regardless of the nature of the vegetation, free draining soils with weakly developed latosolic characteristics occur. Elsewhere in the lower and flatter areas, under either forest or savanna cover, ground water laterite and low humic glei soils appear. The freely drained soils display a pronounced red/yellow coloration and they frequently have a high sand or gravel content, although slight clay accumulation has taken place at the lower profile. By contrast, the hydromorphic soils have a higher silt and clay content and show moderate structural development in their lower horizons. They are seasonally saturated or flooded and display strong gleying and mottling content, although slight clay accumulation has taken place at the lower profile. In many sites the translation of iron has led to the formation of water table fluctuation although no iron pan has developed. Photos 14, 15, 16 and 17 illustrate a number of the above soils and their characteristics.

The general characteristics described above especially the characteristics that can be considered as disadvantageous from the point of view of plant growth are more typical of the mature or zonal soils, these being the soils that occupy the greater part of the savanna-covered and forested areas. From an agricultural point of view, it can be stated immediately and without any reservations whatsoever that, without improvement by man, the grasses growing upon these soils are largely unpalatable and lacking in nutrition while the soils themselves are by and large only the medium by which plants are supported, in which moisture is stored temporarily and through which plant nutrients, resulting from the burning of grasses or forest growth, pass rapidly and directly to the subsoil, thus being lost to plant growth, or almost directly to the root systems of cultivated plants or regenerating grasses and forest species. Fortunately for man, there are some better soils, the immature or azonal soils which, however, are very limited in extent. These soils result from active weathering and degradation on the slopes of many of the residual features, ranging from the lesser inselberg-like impressions in the southern Rupununi in both the savanna and the forest areas to the slopes of the Kanuku, Pakaraima and Maraudi mountains, and also deposition of this material at the bottom of the slopes or, in certain cases, on the rock pediments resulting from the retreat of slope of the residual feature. In addition, there are alluvial deposits to be found where rivers issue from the Kanuku Mts., especially in the northwest of that mountain area as well as discontinuously along the river flats and terraces on which grow the riparian forests of the major river valleys. The agricultural value of these denudational and alluvial soils is determined by the chemical and mineralogical characteristics of the parent

material and the youth of these soils, which means that time has not taken its toll as with the more mature forest and savanna soils and to the structure of these soils which makes them easier to cultivate with relatively primitive agricultural tools. Appendix II with annotation, provides a more detailed analysis of the agricultural qualities of these soils. Also see Photos 18, 19, 20 and 21.

Restricting attention for now to the Rupununi District, a relatively simple pattern of population distribution appears. Almost 95% of the population of approximately 9,000 is Amerindian and, of this proportion, the greater part is located within 10 villages which are within 10 miles of the savanna/forest boundary. The rest of the Amerindian population is located within the forest and close to the bush islands in both the northern and the southern savannas. The remaining small element of the population which is composed primarily of ranchers, some coastal settlers, school teachers, and government administrators, is dispersed throughout the savannas and at the major administrative centre of Lethem. The dominant feature of Amerindian population distribution is that it is peripheral to the savanna landscape (see Figure 2). As already stated, a high proportion of the Amerindian population is located within 10 miles of the forest edge, in fact more than 80% is located within three miles of the forest edge and within this peripheral zone the density of population rises to almost four per square mile, though the figure is higher in the southern savannas where the greater part of the Amerindian population is concentrated.

THE TIME ELEMENT

The perspective of time enables an understanding that comes from an appreciation of the development process. In attempting to determine the nature of the perception of soil by the Amerindian, the investigator is not blessed as yet with the luxury of the time period that is often available in studies in other environments or cultures. There is literature -- by Rouse¹¹, Gillin¹², Farabee¹³, Evans and Meggers¹⁴, Lathrap¹⁵, Bauve¹⁶, Schomburgk¹⁷, Yde¹⁸ and Rivière¹⁹ -- in which fortunately all the authors give some attention to the time depth of the cultures concerned. It is not the intention of the author to become too deeply involved in all the controversies present in these writings, but rather to summarise the findings that are pertinent and, since Evans and Meggers and Rivière have already summarised the findings and views of the others, considerable reliance will be placed upon their conclusions. However, the author did consult all their references.

The immediate objective then in surveying the cultural history of the Amerindians of the Rupununi is to provide answers to the following questions:

1. When did the Macusi, Wapishana and Waiwai establish their present location and distribution pattern?
2. In moving to their present location and in establishing their present distribution pattern, did they move from one major type of environment into another? And in the case of the Macusi and Wapishana, did they move into a savanna environment from a forest environment?
3. What were their movements prior to their migration to the Rupununi District? What were the reasons for migration?
4. For how long have each of these Amerindian groups practised agriculture?
5. Has there been any major change in their sources of food and in the relative significance of fishing, collecting, hunting and agriculture as the major source of food in recent centuries?
6. What have been the staple crops of their agriculture and for how long have cassava and corn been staples?
7. What has been the nature of European contact and especially its impact upon Amerindian agriculture?

There is general agreement between Evans and Meggers, Rivière, Gillin, Farabee and Schomburgk that all three groups arrived in their present locations in relatively recent times. Evans and Meggers, who conducted archaeological investigations in the Rupununi in 1952-53, have conducted the only thorough, although not exhaustive, study of the pre-history of the area. Their conclusions can be summarised as follows:

(i) Archaeologically the arrival of the Macusi and the Wapishana is recognised as the Rupununi Phase, and as such did not appear in Guyana until the 18th century. The Waiwai probably did not cross into Guyana until the present century. In the cultural sequence they are known as the Waiwai Phase. The latter and the Rupununi Phase were preceded by the Taruma Phase. The Taruma Phase is significant in that it preceded both the Rupununi and the Waiwai Phases in the move from either the south or southwest. Its postulated migration from the Lower Rio Negro is dated historically as later than 1670 A.D. Ethnographically, the Taruma was virtually identical with the Waiwai and traded with them for at least a century prior to their extinction about 1925. Meggers and Evans consider the Taruma "a typical representative of the Guiana variant of the Tropical Forest pattern".

(ii) The Rupununi Phase moved from south to north. All the sites in the lower half of the sequence are south of the Kanuku Mts. and all the sites in the upper half of the sequence are north of the Kanuku Mts. "This site

Fig. 2



Source. The estimates of population are based on the Malaria Control count of 1964 and from figures obtained directly from each village Tushau. For 1967 estimates see Appendix III.



distribution is explainable only in terms of a shift in geographical location of the culture from south to north through time. The dates derived from European trade materials place the two earlier sites in the north savanna as 1819 to 1850 and 1780 to 1830, suggesting that this shift took place between 1800 and 1850. The majority of the historical records tend to support a recent intrusion of the Wapishana into the southern Rupununi with consequent displacement of the Macusi to the north".²¹

(iii) As far as movement from one environment to another is concerned, Evans and Meggers suggested that the Rupununi Phase could be equated with the Macusi and Wapishana Indians who are known to have occupied some of the later sites in the sequence. The sampling of sites represented in their Rupununi Savanna Survey led then to the conclusion that the entry of these groups on to the savanna was relatively recent. Evidence indicated that the date of intrusion was most unlikely to be earlier than the end of the 18th century. Use of the savanna for hunting at an earlier time is probable, but the choice of the savanna for residence is clearly opposed to European phenomena dictated by the economic advantages of proximity to European settlements. They claim that the Rupununi Phase in all its features is distinct from all other archaeological phases identified in Guyana, and that historical evidence indicated that the Wapishana and Macusi once inhabited the Rio Branco savannas, though their appearance in the Rio Branco probably does not greatly antedate their arrival in Guyana.

(iv) From where did they come? Evans and Meggers recognise that ethnographically the Rupununi is sub-divided into two tribes with linguistic affiliation to two different language families, suggesting quite different origins, though culturally the Caraban-speaking Macusi and the Arawakan-speaking Wapishana do not differ greatly, at least in archaeological aspects. The archaeological sequence which extends into the 20th century presents a uniform picture in settlement pattern, burial practices, pottery types, etc. However, they have considered Schomburgk's theory regarding the origin of the Macusi, which is, that the Macusi came from the Orinoco, on the basis of resemblances between Macusi words and those referred to by Raleigh²² in his description of tribes along that river. They conclude that "verification or rejection of this hypothesis will have to await further archaeological work in the interior of Venezuela". They have nothing to say on the supposed Rio Negro origin of the Wapishana. However, there is little doubt that Evans and Meggers see the peoples involved in the Taruma, Waiwai and Rupununi Phases as having a forest origin.

(v) Another major conclusion of the authors is highly relevant to the questions raised above. They state that "the cultural sequence in British Guiana has bearing on a number of theories and assumptions of general significance. Like the region at the mouth of the Amazon, this area acted as a recipient rather than an originator of culture traits and complexes. The

late post-Columban appearance substantiates the hypothesis that the Guyanas functioned as a refuge area rather than a fountainhead of Tropical Forest cultural development, as once postulated. The antiquity of settlement by Tropical Forest groups is greatest at both margins of the area -- the mouth of the Orinoco and the mouth of the Amazon -- implying primarily migrations and/or confusion down these two major rivers from the West. Spread along the coast of the Guyanas appears to have been incredibly slow, and towards the interior, practically nil. In fact, it is an open question whether the Rupununi savanna or the upper Essequibo would have yet been invaded by Tropical Forest culture had the original balance not been upset by the arrival of Europeans."²³

(vi) The Taruma, Waiwai and Rupununi Phase peoples have all practised slash and burn agriculture as far back as archaeological evidence goes. The authors comment on variation in the size of fields and in the crops grown, but there is no attempt to discuss the origins of the agriculture of these people. What they do say in regard to agriculture is as follows: "If population composition, accessibility to centres of civilisation, and economic conditions are all variables between the aboriginal and the modern situation, none of them can be used to explain the fact that the Guianas then and now have remained underdeveloped in comparison to other parts of South America. The explanation must lie in some condition constant through time and directly related to exploitation of the region by man. The most obvious factor is the environment, and since agriculture is generally acknowledged to be the foundation of cultural development, the agricultural potential of the environment would seem to be particularly significant. It has been argued that the combination of temperature and rainfall characteristics in the tropical lowlands of South America is unfavourable to intensive agricultural exploitation. In the case of British Guiana it has been charged further (Evans 1939²⁴) that the soils found in most parts of the colony are of low initial fertility, making intensive exploitation even more difficult. These data strongly suggest that the environment is crucial in explaining the secondary role of the Guianas throughout their occupation by man....In pre-European times, the Guianas occupied a position similar to the one they hold today. They were far removed from the centres of New World civilisation and basic inventions and discoveries reached them not only centuries, but millenia, after their introduction to the Western coast of the continent. Once agriculture replaced hunting and wild food gathering, the foundation was laid for the kind of development that brought dense populations and elaborate socio-political systems elsewhere. In the Guianas, however, the primitive pattern of small, semi-permanent villages and simple, kinship-based societies was never superseded."²⁵

In summary, according to Meggers and Evans, the Macusi and the Wapishana did not appear in the Rupununi region until the 18th century, and the Waiwai probably did not enter Guyana until the 20th century. The Macusi and Wapishana probably occupied the Rio Branco first, having moved into this region

from the south and west or northwest. Both had a forest origin and both practised agriculture at least from the mid-18th century. Migration appears to have resulted from initial European contact.

Rivière, in his ethnographic survey of the Indians of the Divide region,²⁶ concluded in regard to the origin of the Macusi that there is no indisputable historical evidence of where the Macusi came from and when, but that certain cultural and linguistic affinities support the historical indication of a more northern origin. In addition, he states that "there is a reasonably strong case for supposing a distribution peripheral to the savannas and possibly exclusively to the north, prior to the drift to the east....There is no lack of reference to the Macusi living at the foot of Pakaraima range and in those mountains. It is not until Schomburgk's time that there is any actual record of them on the open savanna and in the Kanuku mountains."

As far as the Wapishana are concerned, Rivière concluded that there is no irrefutable ethnographic evidence of the movements of the Wapishana prior to the mid-18th century. However, what evidence is available suggests a possible source of origin on the Rio Negro to the east and for sub-groups on the Rio Negro to the south. The historical evidence also supports his conclusion that the Wapishana were most certainly living on the southern Rupununi savannas in greater or lesser numbers from 1810 onwards. However, if it was necessary to state a date for the initial Wapishana migration to the south-east (that is from the Rio Branco), it would be going against what evidence there is to suggest one outside the last decade of the 18th century. It seems highly probable that the Wapishana were in fact a smaller part of a large group of Arawak-speaking Indians, who migrated northward from the Rio Negro, up the Rio Branco, finally moving across what is now a political boundary into the southern savannas towards the end of the 18th century.

And finally he concludes that archaeology demonstrates that the interior of Guyana was neither a source of culture nor a crossroads of migratory movements. With the possible exception of an early, pre-ceramic people, the region was uninhabited until quite recently, probably no more than 200 years ago for the upper Essequibo and rather less for the savanna regions of the Rupununi. At this time an Amerindian population had moved into the region from a generally westerly direction. There was no contact with the coastal cultures.

Bauve & Schomburgk both contributed to the provision of what would appear to be a fairly complete and accurate picture of the development of the Wapishana distribution pattern during the 19th century, and that pattern would seem to be very little different from the contemporary pattern with but two exceptions. Today there are very few Wapishana in the northern Rupununi and the villages close to the savanna/forest boundary are more highly centralised. Rivière supports a forest environment at least for the Macusi and in support of his viewpoint he suggested that the 'horticulture' on which Macusi economy was based was never geared to cope with savanna soils, and the proximity of forest to the mountain side was a necessity for their slash and burn farming. ²⁷

In spite of some relatively recent and interesting material on Waiwai agriculture, it is questionable whether much of the published material is of great importance to this discussion. There is little doubt that the Waiwai migrated to the north from a Brazilian location within the last century, that the most recent phase of the migration was stimulated primarily by missionary activities and that they have remained within a riverine forest environment. As to how long the Waiwai have practised agriculture, the only evidence is archaeological and that is so recent that it is of little value. However, in regard to any change in the relative significance of fishing, collecting, hunting and agriculture as sources of food, Yde in his discussion of 'protected weeds' and semi-cultivated plants, introduces some interesting possibilities. Yde states that "the clearings with the cultivated fields are found in the immediate surroundings of the villages. A walk through the fields does not fail to make one realise that the Waiwai utilised a large number of cultivated plants. These are specimens which are planted and grown deliberately, and also some which invade the clearings naturally and are allowed to grow up because the Waiwai by experience have recognised their useful properties and therefore do not weed them away. In other words, the fields contain cultivated plants and 'protected weeds' or semi-cultivated plants as this category may aptly be called."

One possible interpretation of the considerable significance of the semi-cultivated plants is that this characteristic is indicative of a development towards full agriculture. This conclusion is based upon the premise that the development of agriculture passed through a phase during which man relied upon 'protected weeds' for food of plant origin. It may be possible that the Waiwai have retained this appreciation of the value of the 'protected weeds' for food of plant origin. It may be possible that the Waiwai have retained this appreciation of the value of the 'protected weed' from an earlier pre-agricultural phase in which food was obtained by hunting, fishing and collecting only. This point is made because, under these circumstances, perception of soil would not be particularly sophisticated, if recognised at all as a factor in plant growth.

Niels Fock, a member with Yde of the Danish Ethnographical Expedition to British Guiana and Brazil in 1954-55, in a major work on the Waiwai has also contributed ideas on the development and contemporary nature of Waiwai agriculture. In his chapter on Myths and Legends -- the Creation Myth, he states that "the combination of myth and history with the Wai-Wai thus seems to agree with current theories based on studies of acculturation, The Creation Myth reflecting a development, from a purely hunter and collector culture via the use of cassava with kraua, to a more advanced agricultural culture with, amongst other things, cotton."²⁹

The introduction to the volume contains a statement which is also relevant both to the immediate discussion and the general thesis. Fock states that "the occupational life and technical plane of the Wai-Wai is restricted in its development as a result of their natural and cultural environment. The tropical rain forest limits husbandry to a primitive slash-and-burn agriculture, and the wish for certain communications still further restricts its effectiveness. The primitive husbandry of the Wai-Wai gives no surplus production, which may be traditionally motivated by the wish to maintain hunting as a relatively predominant occupation. In the meantime production is responsible for the fact that there is little specialisation and also, to some extent, for the lack of class division. A determinative angle does not, however, seem to be acceptable to illustrate the inter-relationship between Nature, occupation and community, as primitive views of Nature modify these relations. In the Wai-Wai consciousness, Nature is not apprehended determinatively as an occupational basis, nor is it realised that occupation is a factor limiting community development. On the other hand, the Wai-Wai regard natural environment as consisting of active -- to some extent arbitrary -- powers and forces, whose activities can sometimes be limited or promoted in order to ensure an harmonious existence, both materially and spiritually. The absence of the sun must be impeded by a sun-cult; rain must be driven away by rain-magic. Floods, governed by the Anaconda people, are feared. Threats to the crops must be dispelled, and grain summoned by magic. Thus it is as much the Wai-Wai understanding of Nature as Nature itself that affects cultural development. In this way the religious ideas, therefore, become the basis stamping the occupational and social institutions."³⁰

From opinions already expressed by the author, his reaction to the above views can well be anticipated. Firstly, the tropical rain forest does not limit husbandry to shifting cultivation. It is limited in part by the ecology of the tropical rain forest but also in large measure by both the Waiwai's limited understanding of 'Nature', as Fock accepts, and the lack of communications that might result both in the introduction of new techniques and crops, and a market for any surplus. Nearly all the significant ethnographic literature on the Amerindians includes references to their cultivated plants but rarely to their date of introduction into Amerindian agriculture. The spread of cultivated plants and their introduction into different cultures can be useful in developing a time scale. The introduction of a crop that requires techniques of cultivation and makes demands upon fertility different from those of the existing crops may well give rise to the modification of, or change in attitudes to soil and perception of soil.

The 'ethnographic evidence' of Evans and Meggers, relating to the Macusi and the Wapishana³¹, contains a typical reference to the subsistence crops of these tribes. They acknowledge bitter manioc as the main crop, and maize, sweet potatoes, sugar cane, sweet manioc, pineapples, pumpkins, tobacco, peppers, bananas, plantains, cashew and papaya as 'also planted'. They acknowledge Farabee³² as the source of this information.



Photo. 6 A group of Waiwai children-with one of their Waiwai teachers. (Photo by R. R. Dagon)



Photo. 7
A Wapishana family on the
Rupununi River near Sand
Creek. (Photo by
M. Eden)



Photo. 8 Savanna landscape showing Annai Village on a lateritic ridge and Pakaraima Mountains. To the right beyond the village is the airstrip.



Photo. 9 Savanna landscape near Good Hope with background of Pakaraima Mountains.



Photo. 10 Shifting cultivation on the forested edge of the Kanuku Mountains near Kumu Village.



Photo. 11 Ranch house and corral near forest/savanna boundary.



Photo. 12 Rio Branco in flood with water extending over surrounding savannas.



Photo. 13 Savanna in flood near Pirara, with Kanuku Mountains in background. All that is left of the road is the stream bridge floating in the foreground and the taller grasses of the roadside.



Photo. 14 Outcrop of laterite on the surface of the Rupununi savannas.

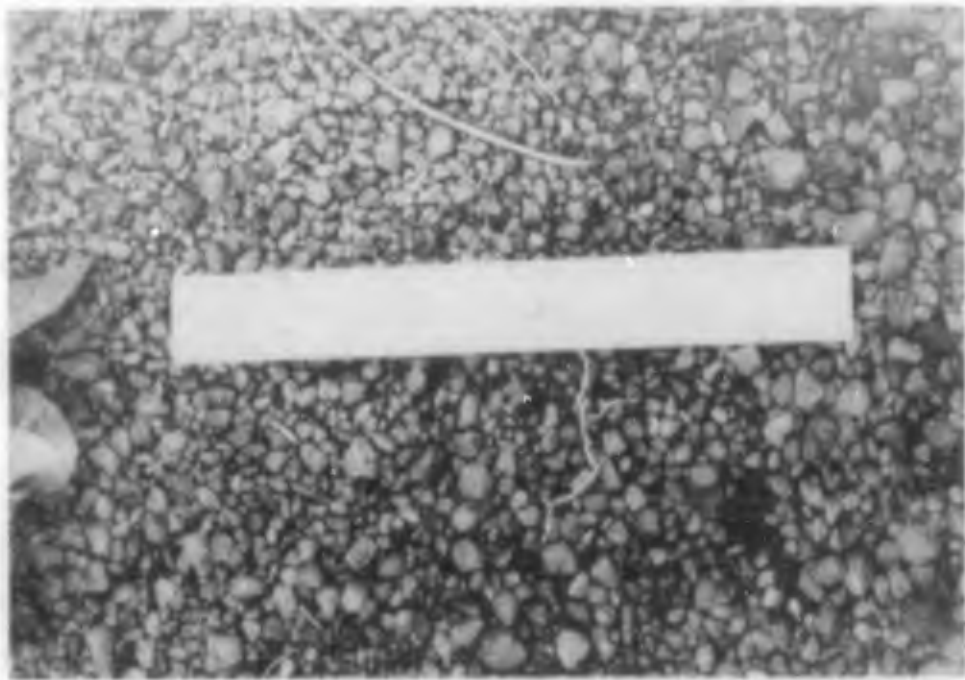


Photo. 15 Laterite pebble soils common to certain areas of the savanna. On similar soils near Nappi, forest growth is dense.



Photo. 16 Lateritic soil profile at St. Ignatius gravel pit.



Photo. 17 A sandy loam profile in the Rupununi savannas.



Photo. 18 Poor Rupununi cattle - a result of the pasture that grows on the savanna soils. The original cattle introduced three centuries ago have been crossed with Hereford and Zebu strains.



Photo. 19 A MocoMoco field, cleared from the forest of the lower slopes of the Kanuku Mountains, growing good crops of cassava (background) and tobacco (foreground).



Photo. 20 A freshly cleared Amerindian field with brush burned away and large unmanageable timber left.



Photo. 21 An Amerindian field with old cassava in background, young cassava in foreground, a papaya tree and sugar cane.

Three crops would appear to be significant in this discussion: bitter manioc, sweet manioc and maize. The cultivation of bitter manioc is universal to the Guiana-Amazon region but farine making was absent from the Waiwai economy until the missionaries introduced it about 1957-58.³³ Sweet cassava was also absent until that time and, according to Rivière, there is no reference in the literature to its presence in the Rupununi District until Farabee's 1918 reference.³⁴ The relatively recent arrival on the scene of a crop so ubiquitous in the Amazonian rain forest regions lends support to the idea of the Rupununi District as something of a 'refuge' and of retarded agricultural development. Additional support is provided by the absence of maize from Waiwai agriculture to this day and its apparent recent introduction to Macusi and Wapishana agriculture. The first reference to maize is Farabee 1918 but it could easily have been introduced earlier in the century. However, none of the 19th century travellers noted its presence. Gillin notes maize as one of the 'aboriginal' cultivated plants of the 'Tribes of the Guiana'.³⁵

CULTURAL DIMENSIONS

-- social, technological and ethno-ecological

As far as it has been possible the Amerindians of the Rupununi District have been located both in relation to their natural environment and the time scale of cultural development of the Amazon-Guiana region. The social, technological and ethno-ecological factors of their cultural dimensions are now to be discussed in so far as they are pertinent to soils. Particular attention shall be given to the role of soils in the location, migration, settlement pattern and agricultural practices of the Amerindians.

Firstly, on the basis of the history of the Amerindians that has already been outlined, what evidence is there that the search for agricultural land and especially fertile soils played any part in decisions related to the migrations undertaken by the Macusi, Wapishana and Waiwai?

On the basis of the quotations and other statements attributed to Evans and Meggers, Rivière, Farabee, Roth, Lathrap, Schomburgk, and all other historical evidence, the Macusi and Wapishana would appear to have moved under pressure both of indigenous warfare and European influence, and as Evans and Meggers have suggested, the Rio Branco/Rupununi region would appear to have been a cultural refuge. Once on the move, there were undoubtedly alternatives available to them. When they reached the Rio Banco/Rupununi savannas, for example, where there are 1000 miles of savanna/forest boundary, for what reason did they finally settle where they appear to have been for the last century or two, and not evenly around the entire savanna/forest boundary?

What evidence is there of soil or of suitable agricultural land having been a significant locational factor? Other questions pertinent to the perception of soil are as follows:

(i) Once the village site was determined, at least partially on the basis of the availability of agricultural land, how did the Amerindians, and how do they presently, select the sites and limits of their fields?

(ii) Is there any relationship between methods of cutting and burning and modification and/or improvement of soil conditions?

(iii) Once the land has been cleared, cultivated, drained, etc., is the ash from the forest employed in any particular way?

(iv) Is there any planting pattern? Is there any pattern related to any feature of the soil?

(v) Is there any planting schedule that is related to the demands of crops, for example, the planting of corn ahead of manioc because of its greater demands on available nutrients?

(vi) From the time of planting, is there any activity such as cultivation, and weeding, which is indicative of an appreciation of the benefits to the soil of such activity?

(vii) And perhaps the most vital question of all, what evidence is there of appreciation by the Amerindians of a reduction or exhaustion of soil fertility as a prelude to the selection and preparation of a new field?

Gillin, in his chapter on tribes of the Guianas, expresses the view that "Guiana settlements tend to be impermanent because of the exhaustion of the soil, inter-tribal wars, the exigencies of trade, and customs demanding the abandonment or destruction of dwellings upon the death of their owner or residents. In forested country, the settlement is usually located at some distance from a navigable river bank, often as protection."³⁶ He also notes that "in this region of many rivers, fishing is of first importance to almost all tribes", a fact which is no longer true of many Amerindian tribes. Nevertheless, there is no doubt that all these factors and others also must be considered in attempting to explain both the selection of site and the overall distribution pattern of settlement. From all the evidence that is available and which has been summarised so ably by Rivière, the forest/savanna boundary close to a major river was the ideal site for Amerindian settlement. A boundary location provided the hunter, collector and cultivator with the best of two environments, for though some of the forest trees that were in great demand might be located a considerable distance from the boundary, the forest provided the possibility of agriculture on the basis of both a closed nutrient

cycle and a greater sufficiency of moisture, while the savanna offered open village sites and a different fauna and flora. In the light of Gillin's statement regarding fishing, the value of the river location is obvious. With a premium on these site characteristics, most settlements tended to be peripheral within the Rio Branco/Rupununi region, with the exceptions provided by riverine sites where the riverine forest zone is or has been wide enough to serve for agricultural purposes. Agricultural activities and savanna fires would appear to have greatly reduced the extent and the quality of riverine forest during the last century.

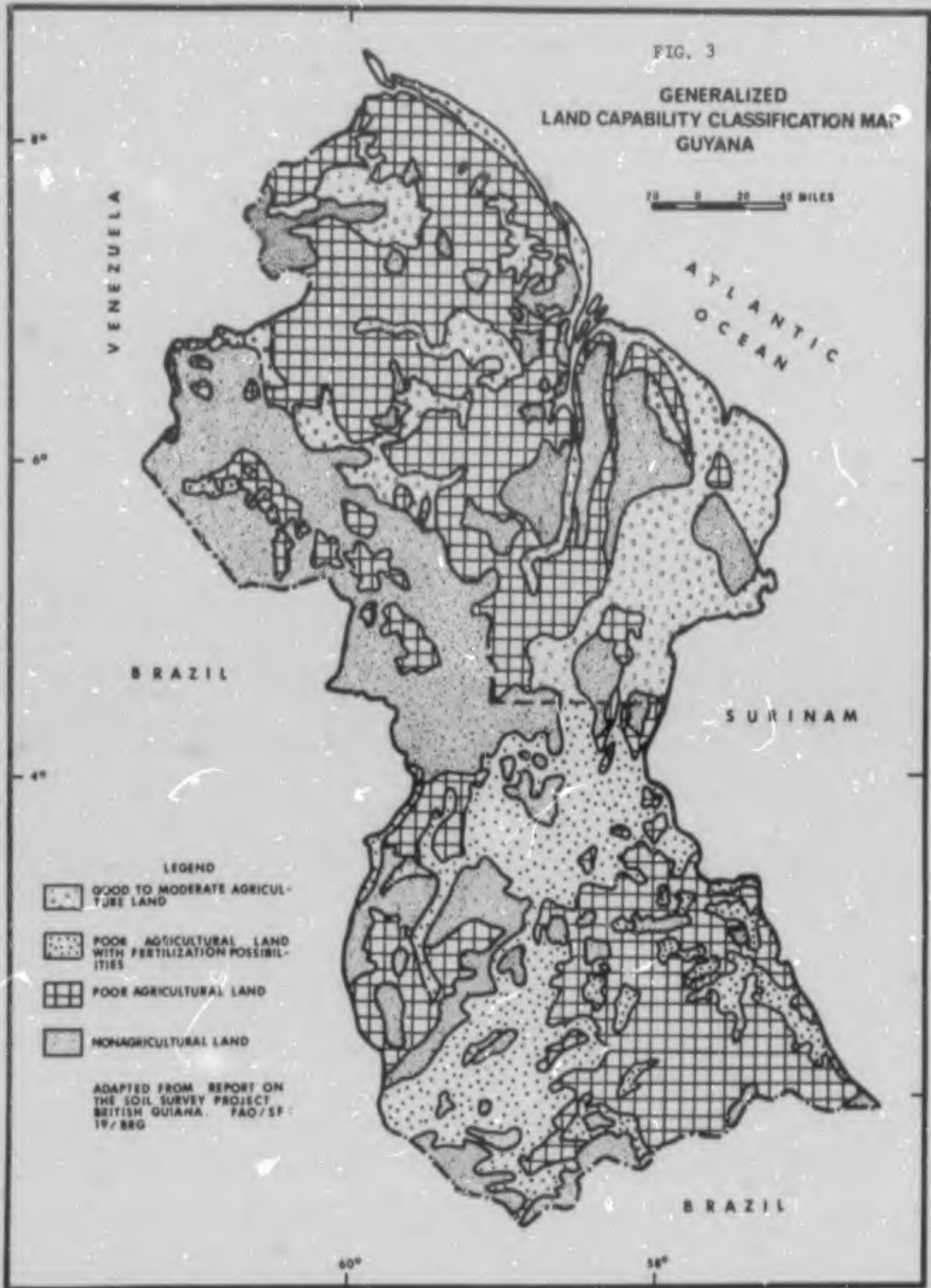
The attraction of such sites was proven when the Portuguese failed in their attempt to settle Rio Branco Amerindians in permanent villages on the banks of the Rio Branco³⁷. The Portuguese made this attempt in 1777 in order to provide a ready labour supply and to facilitate the conversion of the Amerindians to Christianity. They initially succeeded in settling over 1000 Amerindians in five villages. However, within a few years the Indians revolted and only one village, the most southerly and probably the village on the most desirable site, survived. Later attempts were also unsuccessful. These attempts may well have precipitated or hastened the eastward migrations of both the Wapishana and the Macusi. The political boundary hence became a factor in the distributional pattern.

From the time the Wapishana and Macusi crossed the Takutu and the Ireng, the densest concentrations appear to have been on what, at least today, is considered as the best agricultural land. An outstanding exception would be the concentration of Macusi along the southern foot of the Pakaraima Mts, where both soil fertility and soil moisture are relatively unfavourable except in the vicinity of Annai. One compensating factor was probably the greater ease of clearing and burning the slopes of the Pakaraimas.³⁸ Again, it is impossible to state to what extent the Indians were conscious of the agricultural qualities of the land they occupied along the northwestern fringe of the Kanuku Mts. Other favourable site factors were also present: the savanna/forest boundary, excellent hunting in both forest and savanna, good fishing, trading opportunities, and access to well protected sites in the heart of the Kanuku Mts. In the history of Amerindian occupation of these sites, there may in fact be evidence of the complete lack of appreciation or perception of variation in soil quality. These soils, the distribution of which is shown on Figure 3, are considered equal in quality to the best Guyana coastal soils and yet all evidence indicates that fields were rarely if ever used more than for two or three years at a time. Only in the last decade has the fallow period been reduced in some areas to as short a period as from 10 to 15 years. During this period settlers from coastal regions have demonstrated that agriculture on these soils can be practised on a permanent basis. Most authors describing agriculture in the 19th century refer to the typical slash and burn or shifting cultivation of the Indians, but there are no specific statements regarding the cultivation/fallow ratio.

FIG. 3

GENERALIZED
LAND CAPABILITY CLASSIFICATION MAP
GUYANA

70 0 20 40 MILES



Schomburgk describes abandoned fields and states in explanation of the abandonment: "We found ourselves apparently in an abandoned provision field, now run wild, upon which a ruined house still remained. Its former owner, Pureka, was one of the men who accompanied me. Upon this neglected piece of ground, the *Musa sapientium* had reached a height of 40 feet and a trunk in diameter of 14 inches. The average height of the sugar-cane amounted to between 15 and 18 feet. In this respect the richness of the soil here surpassed anything I had ever seen before: the latter consisted of a mixture of humus, loam and sand. The occurrence of a painful death had induced the former proprietor to abandon his house and the rich fields surrounding it...though the Indian is anything but intimately attached to the soil he happens to occupy, and where perhaps he was born, quite a trifling cause often induces him to pack up his hunting-kit as well as all his other belongings and seek some other place of residence, but so long as the fruits of his field are not harvested, he will only shift his quarters if the circumstances seem to be very urgent. It must accordingly have been some such cogent reason that induced the Indians to abandon their fields, then in so flourishing a condition and take their departure."³⁹

- site selections

In any consideration of the selection of the site and limits of a field, little assistance is provided by the literature except that pertaining to the Waiwai. In analyzing the situation now and in the past, Conklin's guide to the investigation of 'site selection' will be used.⁴⁰ Conklin has suggested that the following are factors that should be considered by the investigator and may be considered by the shifting cultivator:

1. Land is considered uncultivable because of

- poor drainage
- limiting surface conditions (rocky, sandy or eroded terrain)
- limiting vegetation (some grasslands)
- religious taboos (sacred groves, cemeteries, etc.)
- other systems of land usage

2. Variables considered within cultivable areas

- distance from one's present field and settlement site (including those other than one's own)
- topography (slope, depressions, etc.)
- exposure to sun and wind
- soil conditions
- patterned vegetation
- ownership and previous use of land
- anticipated labour requirements
- external considerations (government restrictions, crop quotas, etc.)
- planning

In attempting to go through the field site selection process with numerous Amerindians, the author repeatedly found that their initial concern was for the land that was uncultivable -- "that area is no good, it is too wet" or "it's flat" or "there are too many streams to cross to get to it".

Turning now to the variables within the cultivable area, according to Conklin, firstly, distance from one's own existing swidden and settlement site. There is a minimum distance, that is, to the edge of the forest that must be covered and within the Rupununi these distances range from two to twenty miles. The greater this distance, the less distance the Amerindian will wish to cover within the forest in moving to his field. Distance is measured not only in miles but also in quality; difficult rivers and steep slopes increase 'distance' especially for the women who must carry produce from the field to the village. There is little doubt that the factor of 'distance' is vital in field site selection. Distance influences several factors -- the effective time spent at the field, whether or not a temporary move to the field will be made for preparation, planting and harvesting periods, the safety and degree of protection of crops and the amount of produce that can be transported to points of consumption or sale.

The other limiting factors listed by Conklin are not significant in the Rupununi. Sacred groves have not been heard of and, as the Amerindian practises cremation, a cemetery will not be a significant land use. All Amerindians practise agriculture in forested areas on Amerindian reservations where there are no other forms of land usage. Two types of vegetation are avoided, ité palms because they invariably indicate poor drainage, and the occasional small savanna within the forest. 'Limiting surface conditions' usually take the form of surface laterite or a thick layer of lateritic gravel, pure sand, or a sharp change in slope, in the form of a small bluff. In addition, there is a biotic factor -- the presence of acoushi ants, their known, suspected or predicted presence will rule out any possibility of that area being cleared.

The considerable increase in distances between villages and fields resulting from the nucleation of settlements has undoubtedly influenced the relative significance of field site factors. Amerindians would appear to spend less time in the field now than in the past, but of this there is no proof. If this assumption is correct, then less care can be given to weeds than previously. The degree to which temporary residence, at or close to the field, is resorted to as a means of overcoming some of the disadvantages of the great distances will depend upon a variety of factors, one of which is the availability of water. Water sometimes has to be carried from the village well to the site of temporary residence. Another result of nucleation would appear to be the greater concentration of fields and, hence, the shortening of the fallow in order to minimize the distance factor.

Ideally, fields should be well protected from cattle by a thick fringe of forest between the savanna and the field. When distance from village to field increases, the Amerindian cannot afford the luxury of too much protection. One of the advantages attributed to cassava as a staple crop is that it can remain in the ground for a period of up to six months from maturity without deterioration, a factor of the greatest importance with a group which has no means of storage. However, this benefit is nullified if the distance from the field to the village is so great as to discourage the Amerindian woman from visiting the field regularly.

In field site selection the distance from the present field is significant in that the Amerindian woman who goes to the field to plant prefers not to have to travel too great a distance to the old field in order to harvest cassava. In some areas, the new field is merely an extension of the existing field, as in Waiwai agriculture and, to a certain extent, in other areas around the Rupununi. Reference has already been made to the consideration of land as uncultivable because of poor drainage. In the cultivable areas, drainage is again a very significant factor. Ordinarily, too much soil moisture and especially inundation of cassava roots, for even a few days, will cause damage, so it is of vital importance to know the behaviour of the water table and thus to reconnoitre for a site initially at least during the rainy season. A sloping field with a lower flat area which may be inundated for a short period may not be excluded because eddoes thrive under such conditions and if the inundation is regular and for known periods, bananas and yams may even be grown on these sites.

Steep slopes, of the degree that are used in the Pakaraimas, are avoided in the Kanuku Mountain region and are seldom encountered in the south. Exposure to sun and wind does not appear to be a significant locational factor, at least it has never been mentioned by Amerindians. The only way in which wind is considered is that, given the choice of having to locate a field within a bush island, the leeward side would be preferred, as a fringe of forest to the windward side is desirable as a protection against the severest of the savanna fires.

Do Amerindians classify, or at least differentiate between vegetation types in their environment and for what purpose? They clearly differentiate between savanna and forest for a great many reasons. As far as agriculture is concerned, they rarely consider the possibility of using the savanna. One Macusi village is known to have cultivated an area cleared of dense savanna woodland, and with reasonable results, but the cost of fencing such an area is usually considerable. No detailed study of Amerindian vegetation terminology has been conducted, but the author is aware that the Amerindian differentiates between:

1. Virgin dense lowland rain forest, both well-drained and liable to inundation.
2. Virgin dense montane type rain forest.
3. The above forest types regenerating from fire (plot cultivation).
4. Forest with specific trees, such as the Brazil nut tree or balata tree.
5. Various stages of regeneration in abandoned fields.

From the time that a field is so overgrown by weeds that it can no longer be cultivated, to the stage, somewhere between 10 and 20 years, when regenerating forest is no longer too dense to be cleared, Amerindians recognise stages of growth by the disappearance of certain species in the sub-climaxes or secondary succession, but they are not really interested until the forest has reached a stage suitable for re-clearing (see Photos 1 and 2).

Does the average Amerindian understand the ecological relationships involved in the vegetation types he recognises? Does he appreciate that, when he selects and prepares a field in the forest that has regenerated for 15 or 20 years, the soils will have been improved or rejuvenated? If he perceives soil as anything apart from within "land", he will probably perceive the physical condition of soil and especially its ability to retain moisture. There is no evidence that he has any perception of soil fertility as such. His ecological concepts may involve an appreciation of relations between moisture, soil texture, slope and vegetation or crop. Amerindians frequently refer to 'hot' and 'cold' soils. White or yellow sandy soils are 'hot' and they dry out. Some red latosols are described as 'cool' and 'wet', which means they have good moisture retention. The appreciation by some Amerindians that a field in virgin forest would produce good crops does not necessarily mean that they appreciate the benefits of virgin soils; it may simply mean and probably does mean that new fields will produce more ash which is recognised as good for crops.

Thus in site selection it is soil texture and drainage, slope and amount of ash likely to be produced rather than soil fertility that appear to be of significance.

As regards the perception of soil by the Waiwai and the significance of soil as a factor in site selection, Fock makes an interesting observation. He states: "Occupational life is dominated by slash-and-burn agriculture with bitter manioc as the most important culture plant. Sweet manioc is not found as at the upper Rio Negro, nor is maize. This gives the agriculture a particularly light character as no special harvest season is required and storage is

unnecessary. Agriculture can thus be said to be adjusted to man's chief occupations, hunting and fishing, as it does not demand any radical change of mentality in regard to the stability of work. Farming also takes place on lighter soil than, for example, with the earlier and recent neighbours, the Taruma and Mouyena, who primarily cultivated patches of dark soil that were not so quickly exhausted. In consequence, the Wai-Wai were less domiciled than their two neighbouring tribes."⁴¹

Before analysing the above statement, the following quotation from Evans and Meggers should be considered: "Analysis of the site descriptions and the site seriation, brings out several characteristics of the Taruma Phase pattern. The majority of the village sites are surrounded by large field clearings, the exceptions being cases where the hilltop was too small to permit cultivation. The excessive size of some form of clearings suggests that the Taruma followed the same practice as the present-day Wai-Wai, progressively extending the fields. Where the land area is sufficient, the Wai-Wai field is first cleared next to the new house. When a field begins to decline, the adjacent area is planted. It is only after suitable land in the immediate vicinity has been exhausted that a more distant location is found. This stage may be accompanied by the moving of the village if the distance is great enough. That the Taruma followed a similar practice is suggested by the fact that field clearings with habitation refuse tended to be larger than those not associated with villages. Only one independent field clearing reached 200 by 100 meters whereas nine of those adjacent to villages were as large as this or larger, and only four were smaller."⁴²

There is no evidence, other than circumstantial, for the conclusion that Fock comes to in regard to the relations between soil and length of settlement. There is no evidence of the Taruma or Mouyena utilising a field for any longer period than do the Macusi, Wapishana or Waiwai today or in the past. There is also no evidence of the Waiwai waiting for yields to decline.

Is ownership or previous use of land significant in site selection among the Amerindians? In any study of social organization, rights of property are significant and must be given detailed and systematic attention. Of the three tribes considered in this study, only the Waiwai have been given a degree of attention that would allow of any reasonably definitive statements on rights of property, especially as regards the use of land. However, it can be stated with reasonable certainty that the Wapishana and Macusi cultivators have freedom of choice in locating their fields with the exception that, in those areas where pressure on available land has increased, the farms tend to be an extension of existing fields, and it is not too likely that the Amerindian would cut a field immediately adjacent to that of another unless he is a member of the extended family. This is also probably true of an Amerindian cultivator in a small bush island in the savanna, such as in the Sawariwau area. If a

farmer has cultivated in a one bush island for five years to a decade, it is unlikely that another farmer would locate a farm in the one remaining patch of forest in that bush island that is suitable for clearing. The author expected to find that Amerindians, especially the sedentary Wapishana and Macusi, would over a period of years watch the development of a patch of forest in anticipation of making a farm on that site. Not one Amerindian questioned acknowledged such anticipation. Most claimed that they never gave any thought to a new field until the weeds were too much for them in their existing field. However, a number of Amerindians among the Wapishana and Macusi mentioned the discovery of their field during hunting activities in which they had been engaged while taking time off from activities in their existing field.

One thing that can be stated with some certainty is that the cultivator of a field has no prior claim to that land when the farm is again ready for cultivation. Thus, in site selection, whether or not the above is an accurate representation of the situation regarding the rights of property among the Wapishana and Macusi, it would appear that ownership is not a significant factor. The situation among the Waiwai is somewhat different. With the exception of the recent nucleation at Kanashen, Waiwai settlements have traditionally been migratory. Villages have averaged 25 individuals in size and move every 3 to 6 years.⁴³ Once they establish a field they tend to extend the field outward like the Taruma did before them. According to Evans and Meggers, "when a house is built, a slash-and-burn field is cleared behind it and planted. Each following year, the clearing is enlarged for new planting and this continues until the suitable land in the vicinity is exhausted. At this time a new field is cleared on the high spot. If this is more than about an hour's travel away by dugout, the village is usually moved to that location. Otherwise if the old house is in sufficiently good condition, the people will at least remain until the old field ceases to produce. When the field is not by the house, it frequently contains a small lean-to for temporary shelter. When the garden immediately adjacent to the house is beginning to die out, a small area is frequently re-cleared and a second planting of manioc is set out. This practice is not extended to the entire field."⁴⁴

Within a Waiwai village the head, or Yayalitomo, owns the clearing even though it was the result of common effort. It is subsequently divided into family plots of about 2 acres which each family plants and thus acquires the right of use. All produce of the field becomes theirs, except when the field is deserted, then any products become joint property. Amongst the Wapishana and Macusi any produce of a field once abandoned becomes common property. Once the decision is made to migrate, a site some distance from other villages is sought so as not to have to compete in hunting and fishing activities with another village. It is a matter of competition, rather than conflict, because field and hunting territorial rights are always common property.

The other variables considered by Conklin, 'anticipated labour requirements', external considerations, and planning are rarely significant among the Wapishana, Macusi and Waiwai.

The author fully appreciates that other factors may have been overlooked through ignorance of Amerindian culture and language, but it is unlikely that any of these would be of considerable significance.

Turning now to technical aspects of Amerindian agriculture, what other indication is there, if any, of the Amerindian perception of soil? Selection of site and delimitation of the field is followed by clearing and burning. The major question to ask at this stage of the agricultural operation is whether all Amerindians appreciate the significance of ash to the yield of their crops. This is a difficult question to answer. Firstly, what does ash mean? The following data illustrates very clearly what ash means as far as available nutrients are concerned. In one recently cleared field (Aishalton, March 1964) soil sample A was taken, and in the same soil type in an adjacent field with one year old manioc, soil sample B was taken.

Available Nutrients in lbs. per acre	N	P	K	Ng	Ph
A.	24	818	1,000	200	7.9
B.	18	74	178	10	6.3

The growing manioc would not of course have been responsible for the entire depletion of the available nutrients as chemical and mechanical leaching would have taken their toll. Soil sample A was taken in a field in which there was a particularly plentiful and well distributed cover of ash. The normal clearing would produce less. However, this example serves to illustrate the physical reality, but how much of this does the Amerindian perceive? One wonders if he perceives much at all, when logs and large branches are observed being piled up around a field to form a fence. But the Amerindian might well argue with you that it is better to protect a moderate crop from marauding cattle than to see a good crop eaten and trampled down.

The treatment of ash by the cultivator varies a great deal. However, the author has discovered no reference to ash in the descriptions of Waiwai agriculture. In fact, none of the literature on Amerindian agriculture makes any reference to any recognition of ash by the Amerindian cultivator, though there are references to the piling up of branches in order to gain a better burn. But this ordinarily means a better burn for the purpose of a cleaner field. The author has observed both direct manipulation of ash and planting according

to the distribution of ash. Bananas, pineapples, shrubs yielding fish poison and, to a lesser extent, such specialties as pumpkins, melons, okra, tobacco, pepper and herbs, are planted in concentrations of ash. The concentrations may be natural (see Photo 22) where a line of ash results from the burning of an old log that had fallen long before the clearing and burning of the field, or it may result from the scraping of ash into low ridges or mounds. The author has also been told by Amerindians that they prefer a field in a new or 'virgin' forest because it would produce a lot of ash which would "make crops grow better". Can this reply be considered as evidence of Amerindian appreciation of the role of ash in the closed plant nutrient cycle?

Apart from the distribution of ash, are there other factors pertaining to soil which are considered by the Amerindian in planting his crops? Reference has already been made to the differences between 'cool' and 'hot' soils. The Amerindian clearly recognises that the soil that is too 'cool' will produce too much growth above ground in the cassava plant and too little root. He recognises a sandy soil as a 'hot' soil and as preferable for cotton, whereas bananas, plantains, and sugar cane yield best in the 'cooler' soils of depressions. Sweet potatoes do best on slopes. As stated previously, there appears to be recognition here of the role of both soil moisture and temperature.

Dummett has stated that the habit of planting corn first in the succession of corn-cassava-cassava is a clear indication of the appreciation by the Amerindians that corn is a more nutrient-demanding plant than cassava.⁴⁵ The author disagrees for the following reasons: firstly, it could be purely a matter of convenience that corn is planted first, in that it ripens in approximately 5 months, and at this stage weed control is not a problem. If corn was planted as the cassava crop was harvested, weed control would probably be an insurmountable problem. Secondly, corn must be planted towards the end of the dry season in order to grow and mature during the rainy season and the early phase of the dry season. Cassava is harvested in stages but corn cannot be planted in stages. Thirdly, corn is a relatively recent arrival on the scene and has never been a staple crop in this region. It is the rancher who in recent decades has demanded supplemental feed for his cattle in the form of corn, who has largely been responsible for raising corn to the level of a major crop, though it has not yet replaced cassava as a staple. In the southern Rupununi, the Rupununi Development Company has for the past two or three decades encouraged Amerindians to grow more corn and to plant it ahead of cassava. It was obviously in the best interests of the Company and, judging from the rapid increase in corn production, the Amerindian considered it in his best interests too.

For the cultivation of both cassava and corn, mounds are made. The explanation for the mounding is very simple. Towards the end of the dry season when the corn and the first of the cassava are planted and after the corn is

harvested well into the dry season soils tend to be dry and are difficult to cultivate. As a consequence, the Amerindian cultivator scrapes all the loose soil including ash into a mound in order to provide sufficient depth and support for corn and cassava. In most cases then it is a matter of sufficient soil to cover the seeds and to support the cuttings as in the case of cassava. Only where ash is scraped into mounds or ridges is there evidence of an appreciation by the cultivator of some special quality of the material he is moulding.

It is very clear from all the evidence available that, throughout the Rio Branco-Rupununi region, the Amerindian cultivator has traditionally maintained a field for 2 years and occasionally for 2½ to 3 years regardless of the quality of the soil. It is also clear that certain soils on the fringe of the Kanukus could well have been used on a relatively permanent basis whereas the soils in the southeast could not. There are no significant differences between Macusi and Wapishana agriculture so that the failure of the former to exploit their soils fully cannot be explained in these terms. Either weed growth was so overpowering that a second planting could not be considered, or else the Amerindian was so bound by tradition developed in regions to the west, where soils were incapable of supporting more than one crop, or two at the most, that perception of improved growing conditions was impossible.



Photo. 22 A cleared Amerindian field showing ash-line where a large tree-trunk has been burned. A concentration of ash like this would be used to plant bananas or pineapples.

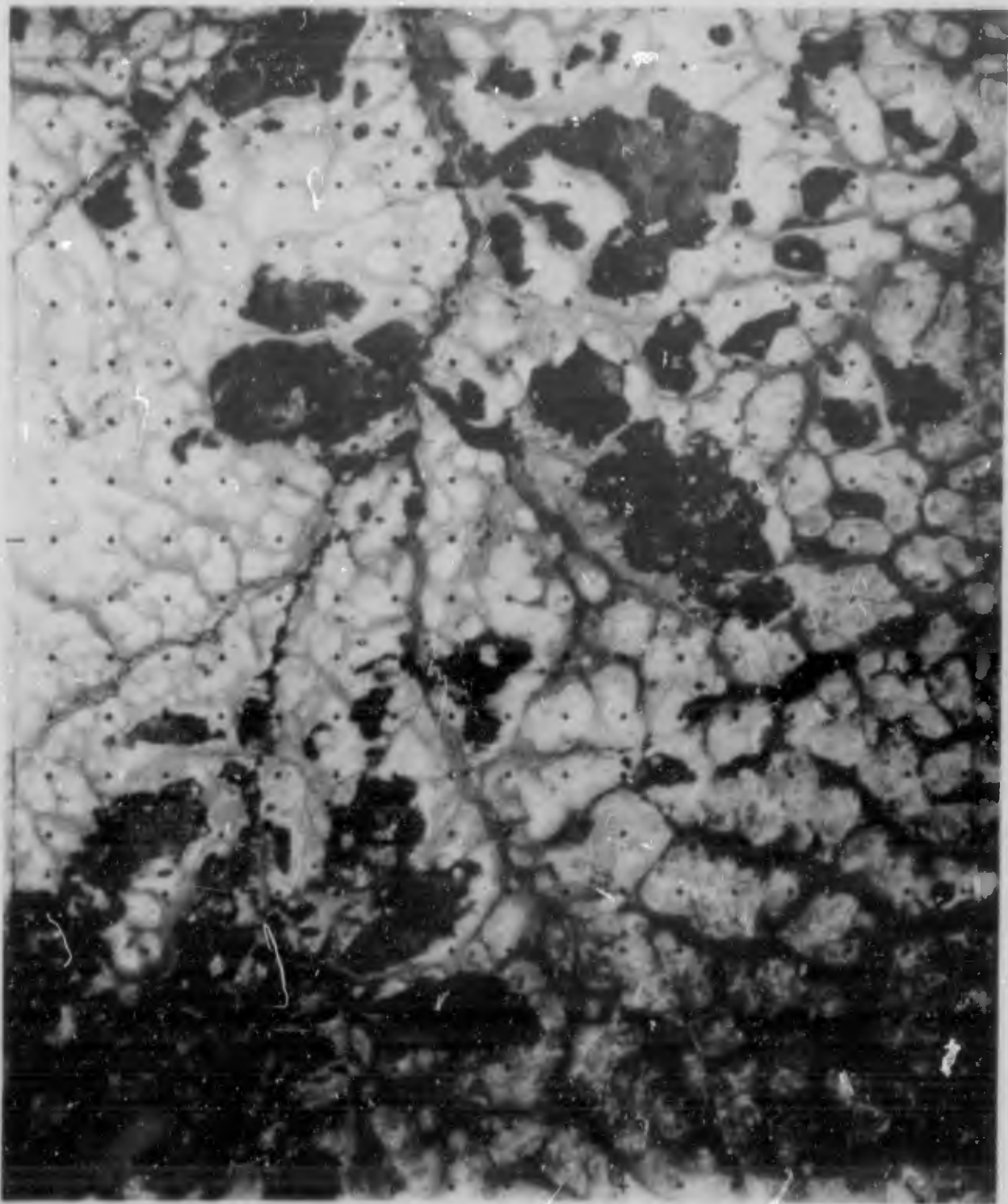


Photo. 23 Bush-islands near Sawariwau. These are used by inhabitants of Sawariwau village. Some islands have little young regenerating forest and there seems little prospect of a 15 year cycle being fulfilled now. Smaller islands show no fringe of forest between fields and savanna. Islands closest to Sawariwau (bottom left) have youngest regenerating forest. (By permission of the Government of Guyana and Hunting Surveys Ltd.)

References

1

For example:

Fock, Niels, Waiwai : Religion and Society of an Amazon Tribe. The National Museum, Copenhagen 1963.

Yde, J. Agriculture and Division of Work among the Waiwai, Folk, vol. 2, Copenhagen 1960.

2

For some results of this special investigation, see:

Dagon, R., Current Agricultural Practices among the Waiwai (a preliminary report with other miscellaneous observations), McGill University Savanna Research Project, Research Series No. 8 1967.

3

In contrast, the Chimbu of New Guinea and the Hanunoo of the Philippines can possibly be considered examples of relatively sophisticated tropical swidden agriculturists for, unlike the Macusi, Wapishana or Waiwai, they have a highly developed understanding and perception of the nature of soil. For a description of Chimbu agriculture see:

Brookfield, H. C. and Paula Brown. Struggle for Land: Agriculture and Group Territories Among the Chimbu of the New Guinea Highlands. Oxford University Press, Melbourne, 1963.

and for a description of Hanunoo agriculture see:

Conklin, H. C. Hanunoo Agriculture: a report on an Integral System of Shifting Cultivation in the Philippines. F.A.O. Forestry Development Paper 12, Rome, 1957.

4

Roth, W. E.

An Introductory Study of the Arts, Crafts and Customs of the Guiana Indians, Smithsonian Institute, Bureau of American Ethnology, 38th Annual Report 1916-1917, Washington, 1924.

Additional Studies of the Arts, Crafts, and Customs of the Guiana Indians, with special reference to those of southern British Guiana. Smithsonian Institute, Bureau of American Ethnology, Bulletin 91, Washington, 1929.

5

Gillin, John. "Tribes of the Guianas", in Handbook of South American Indians, ed. J. Steward, Vol. 3, Bulletin 143, Bureau of American Ethnology, Washington, 1948, pp. 799-860.

6

Evans, Clifford and Betty J. Meggers, Archeological Investigations in British Guiana, Smithsonian Institute, Bureau of American Ethnology, Bulletin 177, Washington, 1960.

- ⁷ Rivière, P. G., An Ethnographic Survey of the Indians on the Divide of the Guianese and Amazonian River Systems. Unpublished thesis, B.L. University of Oxford, 1963.
- ⁸ See J. Dummett 'Notes on Amerindian Agriculture', in this presentation of articles on Amerindian agriculture, pp. 21-28.
- ⁹ See R. F. Salisbury 'Ethnographic Notes on Wapishana Agriculture' in this presentation, pp. 7-20.
- ¹⁰ Dagon, R. Current Agricultural Practices among the Waiwai. (A preliminary report with other miscellaneous observations). Sav. Res. Ser., 8, 1967.
- ¹¹ Rouse, Irving, "The Caribbean Area", in Prehistoric Man in the New World, eds. J. D. Jennings and Edward Norbeck, University of Chicago Press, Chicago, 1964.
- ¹² Gillin, J. "Tribes of the Guianas", Handbook of South American Indians, vol. 3, Bulletin 143, Bureau of American Ethnology, 1948.
- ¹³ Farabee, William C.

The Central Arawaks. University Museum Anthropological Publications, Vol. 9, University of Pennsylvania, Philadelphia, 1924.

The Central Caribs. University Museum Anthropological Publications, Vol. 10, University of Pennsylvania, Philadelphia, 1924.
- ¹⁴ Evans, Clifford and Betty J. Meggers. Archeological Investigations in British Guiana, 1960, p.333.
- ¹⁵ Lathrap, Donald W. "The 'Hunting' Economies of the Tropical Forest Zone of South America: An Attempt at Historical Perspective", MS of paper read at Symposium on Biota of the Amazon, Association of Trop. Biol., Belem, 1966.
- ¹⁶ Bauve, Adam de, Voyage dans l'intérieur de la Guyana. Bull. Soc. Geogr. 1st ser., vol. 20, 2nd ser., vol. 1. 1833-34.
- ¹⁷ Schomburgk, Richard, Travels in British Guiana 1840-44, Vol. 1, translated by W. E. Roth, Georgetown, 1922.
- ¹⁸ Yde, Jens, "Agriculture and Division of Work among the Waiwai". pp. 83-97.
- ¹⁹ Rivière, P.G. An Ethnographic Survey of the Indians on the Divide of the Guianese and Amazonian River Systems, 1963.

- 20 Evans, C. and B. Meggers, Archeological Investigations in British Guiana, 1960.
- 21 Ibid. pp. 328-329.
- 22 Raleigh, Sir Walter, The Discoverie of the Large Rich and Bewtiful Empyre of Guiana, With a relation of the great and Golden Citie of Manoa (which the Spanyards call El Dorado), London 1596.
- 23 Evans, C. and B. Meggers, Archeological Investigations in British Guiana, 1960, pp. 340-341.
- 24 Evans, Geoffrey 1939. 'Note on the possibilities for agricultural settlement of involuntary refugees from Central Europe on the hinterland of British Guiana.' Appendix to the Report of the British Guiana Commission to the President's Advisory Committee on Political Refugees. Mimeo.
- 25 Evans C. and B. Meggers, Archeological Investigations in British Guiana, 1960, pp. 346-347.
- 26 Rivière, P.G. An Ethnographic Survey of the Indians on the Divide of the Guianese and Amazonian River Systems, 1963, pp. 99-112.
- 27 Ibid. p. 110.
- 28 Yde, Jens, "Agriculture and Division of Work among the Waiwai", 1960, p. 84.
- 29 Fock, Niels, Waiwai: Religion and Society of an Amazonian Tribe, 1963, pp. 45-46.
- 30 Ibid. pp. 12-13.
- 31 Evans C. & B. Meggers, Archeological Investigations in British Guiana, 1960, p. 323.
- 32 Farabee, W. C. The Central Arawaks, 1918, pp. 31-32.
- 33 Yde, J. "Agriculture and Division of Work among the Waiwai", 1960, pp. 88-89.
- The missionaries working among the Waiwai introduced farine making, and have a permanent mission station at Kanashen on the Essequibo River.

- 34 Farabee, W. C. The Central Arawaks. 1918, pp. 31-32.
- 35 Gillin, J. "Tribes of the Guianas", 1948, p. 825.
- 36 Ibid. p. 830
- 37 Sampaio, F. X. R. de "Helacao Geographica Historica de Rio Branco de America Portugueza", in Revista Trimensal de Historia e Geographia, Vol. 6, second series, 1850, p. 270.
- 38 Aschman, H. 1952. "Hillside Farms and Valley Ranches", Landscape, vol. 2, No. 1,
- Some of the main reasons are that forest and brush fires burn more intensively up steep slopes than on the level and when larger tree trunks are felled they can be rolled easily away.
- 39 Schomburgk, R. 1922. Travels in British Guiana, 1840-1844, vol. I, pp. 382-388.
- 40 Conklin, H. C. 1961. "The Study of Shifting Cultivation", Current Anthropology, vol. 2, No. 1, pp. 29-35.
- This paper gives an outline of topics to be investigated in the study of shifting cultivation and it stems from diverse sources. It is not exhaustive or complete for any particular system. One of the major topics is 'site selection'.
- 41 Fock, N. Waiwai, 1963, p. 10.
- 42 Evans C. and Meggers B. Archeological Investigations in British Guiana, p. 236-237.
- 43 Ibid. 1960, p. 262.
- 44 Ibid. 1960, p. 260.
- 45 See J. Dummett, "Notes on Amerindian Agriculture".

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SAWARIWAU: NOTES ON THE SOCIAL AND ECONOMIC STRUCTURE OF A

WAPISHANA VILLAGE

by

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SOCIAL STRUCTURE AND SETTLEMENT

Sawariwau is a Wapishana village in the southern part of the Rupununi Savannas. It is located on Rupununi Development Company land, 14 miles to the east of the Rauwau outstation and 19 miles southwest of Wichabai on the Sawariwau River. At the time of the author's visit in 1965 it had a population of 297 of which 95 were adults and 202 were children.

Political leadership is vested in the Tushau (headman) and the village council, but actual leadership rests with the head teacher of the village school. He has come to exercise great authority by virtue of his education and his ability to mix with people (he speaks fluent Wapishana). In addition, the Wapishana here are Roman Catholics, and this teacher is the representative of the local priest who lives in Sand Creek, fifty miles away.

Despite the fact that the village belongs to the Rupununi Development Company, the area is becoming increasingly institutionalised and centralised. The village now has a church, a school and a well. Within a $\frac{1}{2}$ mile radius of the church there are 64 houses, and several others exist in the general surrounding area - but even the inhabitants of these are gradually moving into Sawariwau.

AGRICULTURE

1. Shifting agriculture: this is carried on in bush islands, three to five miles from the village. Bitter cassava (Manihot esculenta), from which farine and cassava bread (the two main dietary mainstays of the village) are made, is the most important crop. It is an herbaceous, semi-shrubby perennial with large fleshy tuberous roots and slender stems averaging 6-8 feet in height. The fleshy root contains a bitter milky poison, hydrocyanic acid, that must first be removed from the mashed starch. There appears to be no knowledge of sweet cassava (Manihot dulcis) in Sawariwau. Other crops grown include maize, yams, watermelon, bananas, plantains and pumpkins. Fruit and nut crops include cashews, mangoes and a few citrus trees.

The fields of family units totalling about 3 acres altogether, are cut and burned between the dry season months of January to April. Planting starts with the beginning of the rains in May.

Apart from occasional sales of prepared farine, the only cash crop is corn, sold at four cents per pound to the Rupununi Development Company or the Government Field Officer. Given a 1250 lb. yield per family plot, the average income is \$50 BWI per family, a year, on corn.

2. Ranching: many of the men work during "roundup" periods for the Rupununi Development Company. During this period they receive from \$30 to \$80 a month, plus food and keep, depending on their skills. The Rauwau outstation is the centre for this work.

There are over three hundred cattle in the village herd, but of these, 167 are owned by two wealthy villagers. Each family unit, however, does have a bullock or two for transportation, although both bullock carts and bicycles are in short supply.

3. Balata bleeding: this is insignificant as a source of income; only two men have ever left the village to go to the bush to "bleed" balata.

HUNTING

Hunting was formerly the chief Amerindian source of protein, but in the case of Sawariwau, the amount of game is becoming seriously diminished. The villagers must now travel 30 miles from the village in order to find the bigger game such as both savanna and bush deer. The largest mammal, the tapir, is no longer found in the area, neither is the giant otter, which is the animal with the most valuable skin.

Some of the animals still found in the general area around Sawariwau are the savanna deer (Cariacus savannarum), bush deer (Coassus rufus), llaba (Cuniculus paca), accouri (Dasyproctus aguti), white-lipped peccary (Dictyles labiatus), collared peccary (Dictyles torquatus), capybara (Hydrochoerus capybara), and the iguana (Iguana iguana). The birds hunted by the Amerindians are muscovy ducks (Carina moschata), wicissi ducks (Dendrocygna viduata) and the maam (Tinamus major).

Exotic furs are becoming increasingly important in the world of fashion, especially those indigenous to South America, and the Amerindians themselves have profited, to a certain extent, from the resultant increases in the price of skins. In 1965 the most valuable skins, and the prices paid for them to the Amerindians were as follows: jaguar (Felis onca) \$35-\$60, ocelot (Felis pardales) \$20-\$35 and the tiger or margay cat (Felis macroura or Felis tigrina) \$5-\$10.

FISHING

Fishing is, relatively, of little importance because there are no good fishing grounds within easy reach of the village. The so-called Sawariwau River is just a creek in the dry season and little protein can be obtained from this source. The Rupununi River, fifteen miles away, has not yielded

many fish in the past two years due to a combination of over-fishing, fish poisoning and low water. The most favoured place for fishing is on the Takutu River some thirty miles from the village. Fishing is carried on by means of poisoning pools in the area.

Since the Wapishana of Sawariwau are Roman Catholics, most of the fishing is carried out for the Lenten season when the villagers abstain from meat. Among the fish caught are tiger fish (Pseudoplatystoma fasciatum), arapaima (Arapaima gigas), lukanani and arrawanna.

APPENDIX I

CROPS GROWN BY WAPISHANA, (observed in 1964).

<u>Field Crops</u>	<u>Annual or Perennial</u>
Bananas	P
Beans (especially brown beans)	A
Corn	A
Cotton	P
Crauwa (kraua)	P
Cucumbers	A
Eddoe (eddo)	A
Hill rice	A
Manioc (cassava)	P
Okra	A
Papaya (pawpaws)	P
Peas (black-eyed variety)	A
Peanuts	A
Peppers	P
Pineapples	P
Plantain	P
Pumpkin	A
Shrubs (yielding fish poison)	P
Sugar cane	P
Sweet potatoes	A
Tobacco	A
Tomatoes	A
Watermelon	A
Yams	A
 <u>Corral and Garden Culture</u>	
Beans	A
Bananas	P
Cashew	P
Citrus trees	P
Coconut trees	P
Corn	A
Cotton	P
Guava trees	P
Herbs (thyme and mint)	P
Improved grasses	P
Jamoon trees	P
Mangoes	P
Manioc	P
Peanuts	A
Prickly pear	P
Pumpkin	A
Soursop	P
Sweet potatoes	A
Tobacco	A
Whitey (whytee)	-

APPENDIX II -- SOILS

Comments on some soils along savanna/forest boundary of South Rupununi

	N	P	K	Mg	pH	Remarks
	(Available nutrients in lbs./ac.)					
1. <u>Typical savanna soil</u>						
(i) Bottom of slope flat	18	18	70	10	6.2	Associated with typically rolling terrain. Surface is uneven, with worm mounds developing. Fine sandy loam graduating down to heavy coarse sandy loam.
(ii) Depression on rolling quartzite ridge	14	9	95	10	5.5	Granulated top soil. The influence of the quartzite parent material is very noticeable.
2. <u>Bush island--habitation site</u>						
(i)	14	74	294	20	5.3	Note the increase in organic matter due to habitation. 3" of coarse sandy loam, very hard; some humus, red sandy loam and gravel.
3. <u>Corral site--Dadanawa</u>						
House Paddock						
(i) 2"	14	133	495	200	7.3	Land is under Bahama grass. There is a substantial build-up in fertility which, unless the corral is fertilized, is due mainly to animals bringing fertility in from the savannas.
(ii) 7"	60	262	243	150	6.8	

	N	P	K	Mg	pH	
4. <u>Granitic hill lightly forested</u> (near Sand Creek) Series of ridges and gullies clear to about 100' from base. Some erosion. Crops: cassava, papaya, pine- apple, cotton, cane and pepper. Gravelly surface.						
(i) Open slope on ridge	34	18	70	10	5.5	Recently weathered rock on slope of 20° plus. Typical savanna soil: 18" of dark brown to dark yellow loam with well-developed granular struc- ture, with bedrock beneath.
(ii) Alluvium in gullies	18	18	90	10	5.6	Another typical savanna soil, found on a gentle slope at the bottom of the same ridge in two gullies. Black loam with well-developed granular structure.
5. <u>Fields - 1st year</u>						
(i) Taken within burn of a large tree	24	818	1,000	200	7.9	2" of ash - very high P content.
(ii) On gentle slope	38	27	588	50	6.4	Soils: 1" of ashy, sandy clay loam with sandy clay loam, then quartz gravel and sandy clay beneath. Field of newly-planted manioc. Note build- up of K, but not so much of P by forest.

(iii) 15' above the flat

N	P	K	Mg	pH
38	36	524	75	6.1

On a slope with little or no relief. The vegetation has only been recently burned.
Soils: 12" of sandy clay down to yellow/brown loam.

Fields - 1st to 2nd years

(iv)	18	74	178	10	6.3
------	----	----	-----	----	-----

Year-old manioc is growing. Note the buildup of fertility in comparison to the usual savanna soils.

(v) Probably located in old field used many times

	24	41	178	50	5.9
--	----	----	-----	----	-----

Sample was taken in a two-year old field of cassava and banana.
Soils: Up to 1" of ashy, sandy loam with high organic content. Then sandy loam, and beneath this, loam with a weak blocky structure towards the bedrock.

Fields - Regeneration
3rd to 4th years

(i) 1-4"	14	18	163	30	6.4
(ii) above 4"	18	27	114	30	5.8

Fast forest growth to 20'; not too thick.
Soils: sandy loam with weak blocky structure down to sandy clay loam and then coarse, white glade.

(iii) 2"	14	41	185	20	6.5
(iv) 6"	38	9	68	10	6.6

Vegetation: sugar cane (20-25' high), papaya (20' and above), and a palm.
Soils: fine sandy loam, graduating downwards through fine sand, coarse sandy to clay loam with considerable mottling to the quartz bedrock.

- Regeneration
5th to 6th years +

N P K Mg pH

(v) In a sandy bottom 24 60 498 75 6.1

This sample shows a significant buildup in fertility.
Vegetation: dense vine growth, trees mostly less than 10" in diameter, about 12' apart.
Soils: 9" of porous sandy loam, then 2' of sandy loam, fine pale yellow quartz gravel, with some orange and yellow mottling beneath.

6. Dense forest at bottom of slope flat

34 92 191 20 5.3

Vegetation: some very tall trees 60' in height, diameter 2'+.
Soils: 3" of well-structured sandy loam with moderately fine crumb structure, gradusting down to structureless sandy loam. This sample shows buildup of fertility at bottom of slope and under trees. Note the buildup of P.

Scale

	<u>Very Low</u>	<u>Low</u>	<u>Medium</u>	<u>High</u>	<u>Very High</u>
N		-50	50-100	100+	
P		-100	100-500	500	
K	-60	60-125	125-225	225-350	350+
Mg		-50	50-100	100+	

Additional Comments

1. Lack of any significant buildup of N is typical of this type of environment.
2. Low P level due to leaching in several geochemical cycles.
3. High levels of K, due to greater mobility, can be taken up again more readily from organic matter than P.
4. Mg again follows organic matter closely - lower than expected for these soils.
5. Ion antagonism in chemical processes of tropical soils not allowed for, but no major difference would be expected.

APPENDIX III

Population Estimates of Some Rupununi Towns and Villages
- 1967 -

(The primary source was a village count on behalf of the Amerindian Lands Commission).

<u>South Savannas</u>		<u>North Savannas</u>	
Achiwib	530	Annai	560
Aishalton	1,134	Cato	100
Awariwaunau	413	Kopinang	160
Karaudanawa	613	Kurukabaru	350
Maruranau	527	Lethem	405
Potarinau	505	Massara	165
Sand Creek	805	Moco Moco	208
Sawariwau	394	Paramakatoi	460
Shea	397	St. Ignatius	416
Shulinab	405	Toka	90
		Waipa	111
		Yakarinta	254
		Yupukari	401

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Security Classification

DOCUMENT CONTROL DATA - R&D		
<i>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</i>		
1. ORIGINATING ACTIVITY (Corporate author)	20. REPORT SECURITY CLASSIFICATION	
McGILL UNIVERSITY , MONTREAL	Unclassified	
	20. GROUP	
3. REPORT TITLE		
ETHNOGRAPHIC NOTES ON AMERINDIAN AGRICULTURE		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)		
TECHNICAL REPORT		
5. AUTHOR(S) (Last name, first name, initial)		
SALISBURY, R. F.		HILLS, T. L.
DUMMETT, M. J.		COOK, D.
6. REPORT DATE	70. TOTAL NO. OF PAGES	70. NO. OF REFS
February 1968	82	23
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)	
Nonr-3855(00)	Technical Report No. 10	
b. PROJECT NO.		
NR 387-020		
c. TASK	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d.	Savanna Research Series No. 9	
10. AVAILABILITY/LIMITATION NOTICES		
Unlimited		
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY
		Geography Branch, Office of Naval Research, Washington, D.C.
13. ABSTRACT		
<p>This report contains four articles analyzing the methods and problems involved in Amerindian agriculture with special reference to the Wapishana tribe. <u>Salisbury</u> is primarily updating earlier works which has become necessary as increased outside influences are felt. These changes are enumerated and their effects on cultivation and settlement described and a future pattern suggested. <u>Dummett</u> examines Amerindian agriculture in order to see what would be the most useful ways of improving the present techniques. All aspects of farming are described, and attempts to cultivate the savanna shown as a future possibility. <u>Hills</u> describes the natural environments of the Wapishana, Macusi and Waiwai tribes and examines the historical relationships of their present locations. The methods of selection of field sites are analyzed and the Amerindian perception of soils in the light of scientific analysis discussed. It is shown that all tribes treat their fields in similar manner despite great differences in soil quality; tradition is thought to be stronger than perception. <u>Cook</u> describes the social life, agriculture and hunting of Sawariwau, a Wapishana village.</p>		

DD FORM 1473
1 JAN 64

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Guyana Rupununi Amerindian Agriculture Ethnography Soils Perception Macusi Waiwai Wapishana						

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