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Crops, Kiaps, and Currency:
Flexible Behavioral Strategies Among the Ilakia Awa
of Papua New Guinea

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Anthropology

by

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ABSTRACT OF THE DISSERTATION

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Professor Philip L. Newman, Chairman

During the twenty-five years since contact with the Australian government, the Ilakia Awa have been exposed to many new influences affecting their traditional way of life. Of major importance are the cessation of warfare, improvement of village health and hygiene, introduction of cash crops, participation in wage labor migration, and taxation. Rather than considering these changes as being imposed on Ilakians by external forces, they are viewed as alterations in the sociocultural environment of the village which make new demands on, and offer new opportunities to, the residents. This investigation attempts to determine the manner in which Ilakians have altered specific behaviors to cope with the new demands and exploit the new opportunities.

Sixteen months of field research in Ilakia Village focused primarily on the interrelationships between the system of subsistence agriculture and the participation of adult men in wage labor migration. Various options available to household production/consumption units in organizing subsistence production are discussed to emphasize the flexibility present in such a production system. The actual selection of alternatives by a fifty per cent sample of Ilakian households, during one twelve-month agricultural cycle, is shown to exhibit patterned variability explicable in terms of the subsistence requirements of, and resources, available to, the specific household units. A highly significant difference exists between the agricultural strategies of patrifocal and matrifocal households indicating the importance of labor availability in organizing subsistence production. The impact of agreement wage labor migration, which alters the labor forces of specific households by removing adult men from the village for two-year periods, on the utilization of subsistence alternatives is discussed. In general, the demographic dislocation caused by labor migration results in a greater reliance on female labor in subsistence production. Also, heavier work demands are placed on men remaining in the village due to the particular organization of labor followed in Ilakia. It is argued that such increased demands on resident males strongly influence the level of participation by Ilakian men in labor migration.

At present, the Ilakia Awa must maintain a viable system of subsistence agriculture which necessitates an adequate supply of male labor. They must also allocate some labor, especially that of men, to wage earning employment to provide amounts of cash needed for the purchase of steel tools, the payment of taxes, etc. The relationship between the requirements of subsistence production and the allocation of labor resources to other activities--e.g. wage labor migration, cash cropping, etc.--provides a means for understanding changing frequencies of behavioral strategies occurring among the Ilakia Awa.

CHAPTER ONE

INTRODUCTION

> "Indeed, a change of existence, whether it be sudden or prepared, always brings forth a painful crisis, for it does violence to acquired instincts which oppose it. All the past holds us back, even though the most beautiful vistas appear before us. It is always a laborious operation to pull up the roots of habits that time has fixed and organized in us."
>
> --Emile Durkheim (1933:241)

> ". . . change *per se* is not necessarily a noxious experience. It is a process that has tremendous adaptive potential, and it is the mechanism whereby progress toward healthier interactions between individuals and environments can be achieved."
>
> --Jane M. Murphy (1965:277)

Prior to the fourth decade of this century, the known physical universe of the members of Ilakia Village consisted of a circumscribed area the radius of which did not exceed the distance a person could walk to and return from in one day. Although other peoples were known to reside outside this region and their lands were visible in several directions from Ilakia itself, little was known of their existence. The fluctuation and unpredictable degree of enmity with neighboring villages made first-hand visitation impossible.

In the mid-1930's, an event occurred which foreshadowed the future. As is not uncommon with such pivotal events, the observers misinterpreted the significance of what they saw and the drone of the aircraft engine caused much confusion in Ilakia.[1] A village elder, who was a young man at the time, related this event to me:

> The first time an airplane came all the men started looking around to see what was making that noise. We hunted and hunted around on the ground trying to discover what was making that noise. We thought it might be a cassowary. We also cut down bamboo and searched inside it. We looked and looked and finally we looked up in the sky and there it was. We thought it was the spirit of a man who had recently died and so we called it by his name, Wehtaiya (Ahrakopia, Ilakia Village, translated from interview recorded 2 December 1973).

By the late 1930's, the people of Ilakia had learned from their Auyana neighbors that the wehtaiya belonged to men with white skins who lived a two-day walk to the north. These white men also had other possessions with unbelievable qualities:

> The first time the Auyana went to see them [the white men] in Kainantu and--we did not have [steel] knives here at that time--and they saw these knives and came and told about them. 'If you want to fell a tree, it does not take three or four chops; just one chop and it cuts it down.' They came

> and told about this (Ahrakopia, Ilakia Village, translated from interview recorded 2 December 1971).

Such were the simple forewarnings of the coming of the white men. Soon to follow were the vast, unforeseeable alterations in the physical and sociocultural environments of the village which would precipitate inconceivable changes in the life style of these people. In less than two generations, they would move from members of a simple autonomous village to active participants in a complex modern state.

Problem and Approach

The problem focus of this dissertation is the analysis and explication of several aspects of sociocultural change occurring in the village of Ilakia, a small community of subsistence agriculturalists in the Eastern Highlands District of Papua New Guinea. Important options in the organization of subsistence agriculture in Ilakia will be described to emphasize the flexible nature of such a production system.

The patterned selection of alternatives actually implemented by a sample of households in organizing their subsistence strategies is explicable in terms of the subsistence requirements of, and the resources available to, the given households. With this understanding of the variation in household production strategies, the impact of labor migration on the utilization of various subsistence alternatives can be discussed. Since labor migration removes adult males from the village for periods of at least two years, it effectively alters the labor resource available to specific households. Therefore, a systematic shift in these household units toward options that require smaller adult male labor inputs is expected. It is argued, however, that even though strategies shift to a more heavy reliance on female labor, the particular system of labor organization followed in Ilakia still results in an increase in work demands on adult males residing in the village when the demographic dislocation caused by labor migration occurs. Such increased demands on resident males strongly influence the level of participation in labor migration by Ilakian men. This systematic interrelationship between the requirements of subsistence agriculture and the allocation of labor resources to other activities provides a means for understanding the changing frequencies of behavioral strategies occurring in Ilakia.

The theoretical model utilized in this research will be called behavioral selection.[2] Briefly stated, the theory of behavioral selection holds that in any sociocultural system there exists a range of variation of behavioral strategies employed by individual members of the group which are designed to acquire and control available resources. Each of the individual strategies extant at a given point in time is influenced by a variety of constraints which are a function of the specific capabilities of the individual, the requirements of membership in,and maintenance of,the group, the pressures emanating from other external sociocultural groups, and the state of the animate and inanimate physical environment. Such constraints exert pressures on particular individual strategy choices resulting in the differential effectiveness of these strategies in acquiring and controlling the desired resources. Furthermore, the availability of resources is assumed to fluctuate as is the structure of desires or demands of the individuals involved. The choice of a particular strategy by an individual is assumed to be the result of a trial-and-error process in which the individual attempts to utilize new information inputs to increase the effectiveness of his strategies for acquiring and controlling various desired resources in the context of operant constraints and resource availability. Those strategies which are more effective in facilitating acquisition of, and control over, greater quantities of desired resources are expected to increase in frequency within the group and those which are less effective to decrease in frequency. In Campbell's terms, the alternatives are subject to "selective retention" (1965).

This model has several important advantages over other approaches to the study of sociocultural change. First, by utilizing the concept of behavioral selection, research efforts are focused on an understanding of the dynamic processes underlying the observable behavioral changes.

Second, emphasis is placed on the behavioral variation present within the group and the processes by which this range of variation is altered. It is important to remember that selection operates on the total range of variation exhibited by the individual members of the group, not on the observed mean average or the stated norm of the group.

Changes in the behavioral strategies of members of sociocultural groups, expecially when involving a relatively large percentage of individuals and occurring frequently within one or two generations, are often negatively described by observers as social disintegration or breakdowns in the traditional way of life. These approaches, however, fatally obscure the underlying causes and processes which account for the changes taking place. At present, population pressure on available resources, a concept variously defined (See especially Allan 1949, Brookfield and Brown 1963, Carneiro 1960, Conklin 1957, Feachem 1973, Johnson 1974, Street 1969), enjoys great vogue as an independent causal factor to explain a wide range of changes in sociocultural phenomena (See especially Binford 1968, Boserup 1965, Carneiro 1970, Flannery 1969, Fried 1967, Geertz 1963, Harner 1970, Smith 1972). A statement by Britan and Denitch, although directed to ". . . analyses of local-level economic patterns in situations of poverty and underdevelopment . . . ", applies to most population pressure models:

> The implication of these analyses is that alteration of the conditions determining such patterns will result in changed behavior and values. A theory dynamically interrelating material conditions and culture patterns is implied, but the mechanisms through which the response occurs are not specified (1975, in press).

Dumond points out the problem with treating the population variable as either an independent or dependent causal factor:

> . . . whereas for heuristic purposes it is possible to consider population size as a factor completely dependent upon certain cultural developments, it is equally possible to consider population size as an independent factor determinative of some of these same cultural developments. That is, population growth is not a simple effect of cultural change but is both a cause and effect of that change (1965:302).

In short, for human groups, population dynamics is a cultural artifact for which it is unwarranted to assume a particular state as "normal." Whether increasing, stable, or decreasing, the fluctuation of population size, density, or pressure must be explained within the context of the particular sociocultural system (White n.d.).

White (1973 and n.d.) and others recently have approached the problem of population dynamics by examining decisions by the members of basic production units in a society--e.g. households--in relation to their evaluation of the amount of productive labor that can be profitably employed under the specific conditions of their production systems. While the potentially important implications of this approach for control of the world-wide human population will not be discussed here, major emphasis will be given to the influence of labor organization and labor availability on the subsistence strategies practiced by Ilakians.

Following Firth (1951), Barth (1967), and Britan and Denitch (1975), the approach followed here denies the traditional dichotomy of stability and change in favor of the assumption that change is a continuous process in sociocultural groups. Individuals are faced with an array of choice situations in which they attempt to develop alternative behaviors in the context of new opportunities and altered environmental constraints.

> . . . from the entry of new factors into the social environment, offering new opportunities . . .Choices will fall differently between the

> new range of alternatives. Activity will take new directions, and form new combinations (Firth 1951: 84).

Although Ilakians are essentially powerless to control the nature or extent of most factors which impinge on their traditional way of life, they do determine the manner in which their lives are reorganized to cope with these changes. That is to say, the forces external to the group are outside their control, but the interal organizational adjustments that attempt to deal with those pressures are largely of their own choosing. In a very real sense, ". . . they must not be regarded as passive recipients of change, but active initiators of it" (Jones 1969:282).

The pacification program pursued in the Highlands offers a clarifying example of the approach followed in this study. Patrol officers charged with halting the intervillage warfare warned the villagers that violent confrontations would no longer be tolerated. All individuals involved in fighting would be jailed and members of offending villages would be forced to pay compensation to victims or relatives of victims. The power of the rifle was often demonstrated to impress local residents of the ability of the Australian administration to enforce the new regulations. The assertion, however, that such aggressive promotion of the pacification program forced villagers to stop their intermittent warfare not only grossly distorts the historical record, but also ignores the options available to the communities affected. What the pacification demand meant was that the Australian government would greatly increase the costs incurred by villages that continued to wage war. The combatants then had a continuum of options available to them ranging from continuing the hostilities to halting the fighting altogether. In the first instance, they would have to meet the increased costs sure to be imposed on them; in the second, they would have to rely on other means of prosecuting their grievances. In fact, most communities adopted a more middle-range position, at least after a few initial experiences of openly flaunting the new orders. They attempted to reduce their reliance on fighting and used the patrol officers, police, and courts to settle most disputes. However, when the remedies achieved by these means were considered grossly inadequate or when the nature of the offense against them was felt to demand an immediate response, violent confrontations were pressed, even with full knowledge of the costly consequences of such behavior. During 1971-72, several violent clashes occurred between villages in the Okapa Subdistrict with Ilakia being a major participant on one occasion. Also, large-scale fighting has increased markedly in the Western

Highlands during the last few years (Meggitt 1974). The Australian government may demand an end to hostilities, but the manner and degree of compliance are decisions made exclusively by the villagers themselves.

An understanding of sociocultural change can not be achieved by viewing these changes as being imposed from the outside. Such an approach leaves unanswerable the crucial questions of why specific groups respond differently to contact in the way they accept some new alternatives, modify others, and totally reject still others. The explanation of systematic adjustment by sociocultural groups in contact must consider not only the nature of the intercultural contact situation, the information flow among the groups, and the new constraints and opportunities presented, but also the precontact organization of the specific groups and the constraints inherent in, and alternatives afforded by, such an organization. All of these factors influence the processes by which individual members of a sociocultural system selectively choose and attempt to integrate new behavioral strategies.

While it is true that the existence of considerable behavioral variation among individual members of a single sociocultural group has long been recognized by students of human behavior, the impact of this realization on anthropological theory has been negligible.

> Anthropological experience with cultural data on particular cultures, culture change and the personality-culture relationship, has not yet been reflected in a conceptual model of culture adequate for micro-evolutionary theory. This model should include the internal variation and distributive structure of a culture (Schwartz and Mead 1961:330).

This directive of Schwartz and Mead is finally being heeded.

> . . . intra-societal diversity presents a serious challenge to presently accepted anthropological theories about human behavior and, at the same time, a great opportunity for theoretical breakthroughs that have thus far been slow in coming (Pelto and Pelto 1975:9).

Field Methodology

My first trip to Ilakia took place during the summer months of 1970 as part of a three-man team headed by Dr. Philip L. Newman who was making a follow-up study of the village where he had resided for twelve months in 1964-65. The third member of the team was Mr. Donald Runstrom who conducted a film ethnography of childrearing practices during our stay in Ilakia.

Our point of entry into the Highlands was the Summer Institute of Linguistics (SIL) base camp at Ukarumpa. There we were able to coordinate transportation arrangements with Richard and Aretta Loving, linguistic missionaries with SIL, who were returning to the Awa village of Mobuta where they have been working since 1959. On the morning of June 30th, we loaded our gear into a LandRover and set off for the "bush." We arrived at the end of the road, near the village of Okasa, just after noon. We were greeted there by a large crowd of people from both Ilakia and Mobuta who had been advised of our impending arrival by radio communication with the Lovings' assistants in Mobuta. From this point, we proceeded on foot with the equipment being carried on the able shoulders of Ilakian men and women. For the next six hours, we walked through montane forest, kunai grassland, and swift-flowing rivers, parting company with the Lovings and the people of Mobuta at a fork in the trail. Just before darkness, we finally arrived in Ilakia, an exhausted trio.

During the nine weeks spent in the village, I concentrated my research efforts on increasing my minimal fluency in Neo-Melanesian (Melanesian Pidgin), collecting basic demographic data, making a detailed map of the village area (with Dr. Newman), and eliciting ethnographic information on subsistence agriculture practices, cash cropping, wage labor migration, and personal resource management. All information was obtained in Neo-Melanesian and a translator (single male, approximately 20 years of age) was employed when necessary. Inquiries concerning subsistence agricultural practices were most often made informally during frequent walks to garden sites. Formal interviews were arranged with specific individuals to gain systematic information on their gardening and wage labor histories, experience with cash cropping, and control and distribution of personal resources. Participant observation, of course, occupied the major part of the time devoted to research. Areal measurements of a number of nonrandomly selected garden plots also were carried out to gain some familiarity with the problems involved in this operation.

Due to my tottering linguistic proficiency, the nonrandom selection of gardens and informants, and the limited time spent in the village, the information obtained during this initial research period provides only the shakiest of ethnographic baselines. The main purpose of my initial efforts in Ilakia was not to amass a large body of randomly obtained and thoroughly cross-checked data on a specific topic, but rather to study the demographic and spatial characteristics of the village and to make a wide variety of contacts with the residents under varied conditions to evaluate the kinds of information and the degree of specificity obtainable for the various topics of concern to my proposed follow-up research. The experience gained on this level was invaluable in formulating a workable research design to guide my future studies in Ilakia. On leaving the village on 1 September 1970, I announced my intention of returning the following year for an extended stay, a suggestion that was met with approval by at least the most verbal residents.

In September 1971, I arrived at the Subdistrict Headquarters in Okapa to commence my second field experience among the Ilakia Awa. Since I was going into the bush by myself on this trip and there were no radio communications with the village of Mobuta, due to the temporary absence of the Lovings, there was a problem in trying to get word to the Ilakians that I was planning to live in their village. The first National Day celebrations were to take place in a few days and the government officials in Okapa had received word that it was "very likely" that the Ilakians would be coming in for the festivities. I decided to wait in Okapa for their arrival and was not disappointed. Although I did have some difficulty distinguishing the Ilakians from among the numerous groups of performers on the dance ground, all of whom were wearing their finest body decorations, I finally singled them out. They obviously had similar problems of recognition for when I approached them, I was met with blank stares. After a few tense moments, the silence was broken by a young man who shouted my Awa name, Ahwainto, The Bearded One. The greetings were warm and they agreed to meet me two days later at the end of the road to transport my equipment to the village. The plan was carried out without further complications and I arrived in Ilakia late in the afternoon of 15 September 1971.

For the first month in Ilakia, I lived in one of the three government rest houses which are maintained by the village to house government officials when they visit the area on patrol. During this period, a group of men and women selected the site for my house on a knoll between the men's houses of Opingkape and Napaitape hamlets and completed the construction. It was a cylindrical structure approximately twelve feet in diameter and six feet high with an outside wall of plaited bamboo strips and a conical roof of grass thatch. The dirt floor was covered with a woven bamboo mat and a table and sleeping platform were built in as permanent fixtures. The only external features that distinguished my house from others in the village were two windows of translucent polyethylene nailed over openings cut in the outer wall. Two other structures, a cookhouse (similar to, but of slightly smaller dimensions than the main residence) and a latrine with an attached shower stall, completed my compound.

During my first evening in Ilakia, two married men in their late twenties approached me and offered their services as assistants. Since they were the only individuals to mention such employment, I assume that they did so with the consent of other eligible residents. One of the men had worked for Dr. Newman in 1964-65 and this experience made him a natural choice for the job. I explained that their responsibilities included arranging for the purchase of locally grown foodstuffs, firewood, and water (which had to be carried a considerable distance to the village), carrying out the daily domestic chores of building a fire, cooking the tubers for the evening meal, and washing the dishes, and assisting me in conducting formal interviews and administering occasional questionnaires. I stressed that the workload would only be part-time and that I did not want it to interfere with their own subsistence activities; the reason I was willing to hire two assistants was to reduce the amount of time that each had to spend helping me. I explained that if my schedule of activities conflicted with their responsibilities as heads of household in the village, they should tell me as far in advance as possible and I would rearrange my plans. I also spread the word of these arrangements to other members of the village to provide a check on my assistants. On only two occasions were complaints brought to me about my assistants slacking on their village responsibilities. One involved a village project in which participation was voluntary and with which many other men also had not helped. For these reasons, I felt the verbal abuse directed toward my assistant was unwarranted and allowed him to use his work obligations to me as an excuse for his lack of participation. The other incident involved a complaint from the wife of one assistant that he was not helping with garden preparations. This was the type of situation I had expressly hoped to avoid and a small amount of investigation determined that the real interference in his connubial responsibilities stemmed from the attentions being directed toward a possible second wife. A long discussion of the matter, including a threat of termination of his services if he again used me as an excuse for his domestic problems, brought my involvement in the matter to a rapid halt. His courting activities continued and the altercations with his wife became more violent, but his employment relationships with me was never again invoked to obviate his domestic responsibilities. These two men continued to work for me throughout the period of field research. They proved to be not only capable assistants, but also close and valued friends.

For their part, my assistants requested that part of their wages be given as board. While this involved transporting a slightly larger supply of store goods from town, I agreed to the arrangement and the three of us shared a package of dried soup and a tin of meat or tuna along with the usual plate of assorted tubers for the evening meal. This daily event turned out to be a very enjoyable social gathering as well as a valuable research situation. To my recollection, there were only two evenings during my entire stay in Ilakia that the three of us alone shared in the evening meal at my house. Casual (and, I suspect, some not-so-casual) visitors would invariably stop by my house during mealtime and were always given a small portion of the remaining fare. I came to rely heavily on these occasions for information concerning daily events, individual activities, and village gossip. These gatherings also provided an excellent informal situation in which to check, expand, and clarify information collected and observations made during the day. The possibility of a portion of hot soup and tubers was enticement enough to perpetuate these gatherings and the size of the cooking pots set a fixed limit to the expenditure of food. It was necessary, however, on several occasions to discourage people from coming to visit at mealtime since the group would periodically grow to such size and regularity that my assistants would complain that they were not receiving an adequate share of the meal. A short speech of normal exaggeration stating that I could not feed the whole village and complaining that some people sold food to me and then came and ate it (a major breach of Awa etiquette) would quickly bring the situation under temporary control.

When the frequency of formal interviews increased and the garden measuring project got under way, I hired a third assistant to share the workload. I also utilized several other individuals occasionally when an unplanned situation occurred that demanded translation. Of the thirty men in the village who had at least a minimal knowledge of Neo-Melanesian, thirteen commanded the language with adequate fluency to translate. For this reason, it was a rare situation in which I needed a translator and was unable to locate one in the near vicinity.

Four basic information elicitation techniques employed during the research were questionnaires, formal open-ended interviews of all members of specific subgroups in the population and of key informants, participant observation with informal interviews, and quantitative measurement projects. Specific applications of each technique and the time period during which each occurred will be discussed.

Questionnaires were used on four occasions: 1) human population census (16-17 September 1971); 2) garden inventories of all households (26 September to 24 October 1971); 3) pig population census, coffee garden inventories, and additions to subsistence garden inventories for all matrifocal households (26 March to 30 April 1972); and 4) equipment inventories of all households plus a recheck of current garden inventories and human and pig populations (13 September to 7 October 1972). For all questionnaires except the first human population census, the information was elicited directly from each head of household.

Formal open-ended interviews of specific subgroups were employed in collecting detailed work histories of all returned migrant laborers (21 October 1971 to 26 April 1972) and personal life histories of all married men (23 February to 21 April 1972). These sessions were normally arranged in advance and varied in duration from 20 to 90 minutes. I attempted to structure the interviews into a chronological narrative form, but encouraged individuals to elaborate on any and all aspects.

Specific questions were interjected where necessary to insure that all informants covered specific topics of concern to me. Approximately one-half of these interviews resulted in unusual or seemingly conflicting information, often involving specific kinship relationships between individuals, which demanded additional clarification. Such follow-up sessions were more informal and usually conducted in the evening during a visit to the informant's residence. This technique of using a similar open-ended instrument for all individuals in a defined subgroup of the population was extremely effective in eliciting massive detail of the topics covered. It also proved convenient during these interviews to collect current pig population figures, coffee garden inventories, and information on new subsistence gardens for the patrifocal households involved.

Intensive formal open-ended interviews of key informants were used on various occasions throughout the research period to elicit in-depth information on specific topics from individuals with specialized knowledge. These usually involved one or two older men (and, on one occasion, an elderly woman finally agreed to participate) and each session focused on a specific subject--e.g. warfare patterns, agricultural techniques, trade relationships, ritual observances, kinship nomenclature, introduction of new plants, contact history, stone tool technology, pre-contact village sites, health and curing, spirit attributes, botanical terms, soil types, etc. Wherever appropriate, informants were encouraged to elaborate on changes that had occurred during their lifetimes. These interviews lasted from one to two hours and additional sessions on the same topic were usually held on consecutive days. For the Ilakians, a third session on any topic seemed to exhaust the informant's interest, the translator's concentration, and therefore, the ethnographer's patience and productivity. Such situations of intensive question-recall-response interactions are completely foreign to the Awa and considered extremely laborious. Adding to this the rigors of translation and the redundant questioning of a non-Awa mind, the occasional futility of eliciting specific information from a specific individual on a specific day becomes more understandable. As my knowledge of and rapport with the Ilakians increased, so did my gratitude of their tolerance for the initial fumbling attempts at systematic interviewing.

When residing in a small, relatively isolated community, such as Ilakia, the research technique of participant observation is a fact of life. My gradual entrance into the daily stream of behavior in the village provided an endless source of observations and questions. Whenever possible, participants and bystanders were asked about activities as they were occurring. Their answers and my observations were recorded on the spot in a small bound notebook. When such inquiries resulted in insufficient or confusing explanations or required cross-checking, the topics were pursued in more detail with my assistants at the evening meal, with casual visitors to my house, during visits to the men's houses and individual residences made several nights each week, or in subsequent formal interviews.

Apart from the quantitative data that were elicited using the above-mentioned techniques, the following four separate projects were formally organized to obtain specific numerical measurements: areal measurement of a fifty percent sample of subsistence gardens, areal measurement and tree counts of all coffee gardens, weighing of tubers harvested daily for fourteen days by five selected households during two seasons of the year, and a random sample of adult male and female heights. Other quantitative data of various kinds--e.g. labor inputs and productive outputs of subsistence gardens--were also collected, but due to the irregular nature of these activities and the constraints imposed on me by the Ilakians (which will be discussed in Chapter Three), formal measurement projects were not appropriate. The procedures used in gathering the quantitative information will be included in subsequent chapters in conjunction with presentation of the empirical data.

As is evident from the above discussion of data collection techniques, all information was elicited in Neo-Melanesian and translators were used when the informants did not speak Neo-Melanesian. Unfortunately, my facility in the Awa language never surpassed the most rudimentary level of social discourse. A tape recorder was used for most formal open-ended and key informant interviews except when my normal request to record a session was refused by the subject. On several occasions I turned off the recorder in the middle of an interview when I thought it was interfering with the concentration or in some way was upsetting the performance of the informant.

The information that was collected from the particular combination of elicitation techniques utilized on any given day was converted into the main body of typed field notes. The activities participated in, observations made, and information elicited during the day were recorded in chronological order. A serious attempt was made to do this on a daily basis and I never fell behind more than three days. The time required for this task ranged from one to three hours per evening and probably averaged about one-and-one-half hours. While this was the most enslaving aspect of the field work effort, it was absolutely essential to maintaining accuracy and continuity in the research.

Several methods were used to compensate individuals for information and assistance. Generally, I attempted to avoid making direct payments for information since such a practice forces one to establish criteria by which to determine when information is worthy of payment and when it is not. Such criteria artificially structure (and, I believe, limit) the situations in which information will be given. Furthermore, it emphasizes the fact that the visiting ethnographer, who has cash, but no gardens or pigs, is the local focus of a foreign economic system that temporarily overlays and has little relationship to the existing socioeconomic system; analogous to discovering a small vein of low-grade gold ore in the village. Due to my limited knowledge of Awa, the younger men who spoke Neo-Melanesian would obviously receive a much greater portion of the money distributed than would the older, more knowledgable men if payment was based solely on the gross quantity of information produced. To cope with these problems, I discussed numerous alternatives with my assistants and relied heavily on their suggestions. While they did not always agree with my decisions, which they occasionally felt gave compensation to individuals who did not deserve it, their advice was immensely helpful in formulating the compensation scheme employed.

My three permanent part-time assistants were paid a fixed wage fortnightly. I also took each of them to Goroka with me on separate occasions, trips which we all enjoyed very much. Key informants were usually invited to eat at my house on the evening of an interview. In addition to this immediate acknowledgement of their help, I would ask them to choose an item they wanted--e.g. bushknife, axe, blanket, beads, or clothing--and I would bring it as a gift for them on my next trip to town. Individuals who, on a given day, had helped me with some informal translating, had taken me to their gardens with them, or performed some other act of kindness for which I wanted to show my gratitude were either given a stick of twist tobacco or invited to eat at my house. Several individuals and families took a special interest in my work and well-being and I attempted to acknowledge, rather than repay, my debt to them with an occasional gift.

To compensate the village as a whole for allowing me to live among them, for making a consistent supply of local foodstuffs available for purchase, and for cooperating with the questionnaires and interviews that were imposed on a large proportion of the village members on several occasions, I sponsored two village feasts. The first one was held the day my house was completed near the beginning of my stay in Ilakia. Individuals who had helped with the construction were given small cash payments. Copies of mug shots of all village members, which I had taken in 1970, were passed out, and fifty-five pounds of rice was cooked, liberally laced with tinned fish and corned beef, and distributed to everyone present.

The second feast was held about one year later, a few days before my departure from Ilakia. Two days prior to the event, a village meeting was called and several influential men tried to talk me out of holding the feast. Their concern was that I had already given them one feast and they still had not held one to specifically repay me. If I now gave another one, they argued, other villages would laugh at them and say that they did not treat their white man properly. I countered their arguments by saying that they had in fact already repaid the first feast by telling me stories and answering my questions; stories are like food for me and I have "eaten" many good stories; now it is time to repay you for this "food". The dispute waxed and waned for several hours and was finally ended with the agreement that I could hold the upcoming feast as planned, but that when I returned to visit Ilakia, I could not give them any food until they held a proper feast for me.

Besides the compensation that was given in the form of cash, commercial goods, and food exchange, I also rendered a number of services which were either difficult or impossible for Ilakians to accomplish on their own. The medical officers in Okapa gave me a large supply of simple medicines and dressings and I spent several hours each week treating coughs, fevers, wounds, and skin ulcers. After much coaxing by people suffering from toothaches, I also tried my hand at pulling teeth. With only a limited supply of codeine tablets and a pair of needle-nose pliers, these attempts at dental "treatment" were some of the most anxiety-producing experiences of my stay in Ilakia. About a dozen successful extractions were performed and luckily no serious injuries were inflicted. These individuals were the most grateful of all my medical "patients". While I felt that my attempts at oral surgery bordered on the inhumane, Ilakians thought they were a real treat compared with the local alternative of cutting the gum away with a bamboo razor and beating out the offending tooth with a stick and hammer stone.

Due to the long distance to the nearest store, I acted as sort of a purchasing agent for Ilakians on my trips to town. Individuals would ask me to buy specific items for them and would reimburse me when I returned to the village with the goods. While this considerably increased the amount of goods that had to be transported on these trips, it eliminated the problem of finding men willing to be hired as carriers.

Other services which I was able to provide included writing letters of reference for men going to seek employment in town, helping with the writing of letters to relatives working on the coast, providing paper, pens, envelopes, and stamps for such letters, carrying tape recorded messages to and from relatives working in Port Moresby on my one trip to that city, and freely giving a few sticks of matches and newspaper for rolling cigarettes to anyone who asked for them.

These limited attempts to share the skills and resources at my disposal were met with universal approval by the Ilakians. They also helped to make my stay in Ilakia a more pleasant one by dulling the basically parasitic feeling of being a "nonproductive" adult male among a subsistence agricultural population.

Historical Context

To adequately understand the changes that have taken place in Ilakia Village during the twenty-five years that have elapsed between the first visit of an Australian government patrol in 1947 and the conclusion of my fieldwork in 1972, it is necessary to present a general picture of the broader context in which such changes have occurred. In this immediate post-contact period, the more dramatic changes in the New Guinea Highlands have been either directly or indirectly related to the influence of the Australian government or, more specifically, the expatriate colonial administrators, called "kiaps", of the then Territory of Papua New Guinea. While the specific directives issued by the colonial government are voluminous,[3] the major programmatic aspects of policies designed to "modernize" and "develop" the Territory can be fairly summarized as follows: 1) cessation of intervillage warfare; 2) improvement of village hygiene and health care; 3) encouragement of participation in wage labor migration; 4) introduction of cash crops; and 5) establishment of local government councils with the power of taxation as the lowest echelon of a national bureaucratic structure. These policies formed the basis of a general pattern of colonial expansion and cultural domination followed throughout the entire area.

Comprehension of the rationale of this program, as well as its impact on a single village, such as Ilakia, demands some discussion of the nature of contact between the local Highland populations and the recently-arrived expatriates of various foreign countries.

The original discovery of the Highland populations in New Guinea was made in 1930 by two men, Michael J. Leahy and Michael Dwyer, prospecting for gold (Leahy and Crain 1937). According to Mair, the search for gold " . . . was the most important single incentive to the penetration of the New Guinea mainland from the north" (1970:36). While these prospectors were not notably successful in their search for gold, they did push forward into the interior of the Highlands.

> Often, and most outstandingly in the discovery of the populous highland valleys of central New Guinea, the miners moved well ahead of all other forms of colonial penetration" (Brookfield 1972a:28).

The initial reports from miners of previously unimagined population concentrations with well-tended agricultural plots prompted government officials and missionary groups to move quickly into the area to explore the potential of human and physical resources. Several government-sponsored reconnaisance patrols walked through the Highlands during the next several years and commenced efforts to bring the area under administrative control.[4] Ironically, these initial attempts to pacify the local populations were interrupted by the hostilities of World War II. Following the expulsion of the Japanese army from the island, the Australian government once again established outposts in the Highlands and the campaign to stop intervillage warfare and consolidate government control continued.

Initial contacts between the Australian government patrols and the local populations were remarkably nonviolent. When hostility was expressed, it was usually focused on subsequent patrols.

> The highlands . . . perhaps heard rumours of new men, but these were without any comprehensible reference, and the exploring parties were generally greeted with astonishment. The first reaction varied greatly: sometimes fearful, sometimes friendly in the hope of gain, sometimes overwhelmed by an apparent return of ancestral spirits. Rarely was the reaction immediately hostile, but hostility usually followed, and there were both extensive thieving and some mass attacks (Brookfield 1972a:85).

Mair also supports this view:

> Although most of the actual exploration of this inner fastness of New Guinea [the Central Highlands] was carried out with a minimum of bloodshed and in many cases without hostilities of any kind, the warlike populations did not settle down

> at once to amicable relations with those white men who established themselves among them" (1970:37).

Violent encounters certainly did occur[5] and deaths, some of which were legal executions,[6] were suffered on both sides. The white men who were killed were most often prospectors and missionaries living in isolated outposts. In spite of the deaths that were recorded, it is not unfair to state that given the size of the resident population, the extent of the land area brought under control, and the endemic warfare that apparently existed prior to contact, bloodshed to date has been minimal.

The reasons for the relatively peaceful conquest of the Highlands are many and assuredly complex, but several contributing factors are important to this discussion.

The pattern of intervillage warfare and limited social alliances between neighboring villages greatly restricted the number of warriors that could be organized into a single fighting unit. Without such armies, the villagers were quick to realize their vulnerability when armed only with bows and arrows.

The material possessions of the white men, especially the steel tools, also impressed the people, and the promise by the government to end all warfare in the area was met with general approval. This is not to say that the people of the Highlands were quick to lay down their arms and entrust the defense of their villages to the Australians, but rather that the possibility of gaining relative peace and increased material wealth by cooperating with the foreigners appears to have resulted in much voluntary compliance with government pacification edicts.

The policy of calculated restraint followed by the Australian government in dealing with potentially explosive situations certainly contributed to the low level of hostility between the patrols and the local people. Sir Herbert Murray, Lieutenant-Governor of Papua from 1908 until his death in 1940, gave explicit orders to his famous "outside men":

> Officers should never forget that it is the settled policy of the Government not to resort to force except in cases of necessity when all other means have failed, and that it by no means follows that because an officer may have a good defence on a charge of manslaughter that his conduct will, therefore, escape censure (quoted by Souter 1963:158 fnt.).

While some patrol officers were more successful than others in avoiding open conflict,[7] the early patrol reports contain many accounts of defensive actions taken by the officers in charge to avoid moving into situations that might encourage an attack by local warriors and demand an armed response. Of course, no written reports by the local populations exist to validate the government accounts, but information obtained from informants in Ilakia concerning specific incidents of hostile encounters with the early patrols tends to confirm the limited use of firepower by the government. On numerous occasions, the power of the rifle was demonstrated by shooting pigs that were purchased by the patrols for food, and by blasting a number of wooden war shields. The witnessing populace was invariably impressed by the strength of this weapon and often attempted to enlist the support of the patrol in attacking a troublesome enemy (e.g., See Patrol Report, Kainantu No. 2, 1949-50, p. 6; Sinclair 1966, 1969; and M. Leahy's diary entry, 22 February 1934, quoted in Langness 1968:306). This acceptance of the superior military might of the invaders not only saved many lives in the villages, but also benefitted the Australian government by eliminating the expensive consequences of a violent military conquest.

Apart from the financial burden that would result were large-scale military operations necessary to subdue the local populations, such confrontations also defer the immediate exploitation of the one resource that is most essential to the growth of the colonial sector, labor. "Generally speaking, the first major call of the colonial economy on a newly penetrated region has been on its resources in labour" (Brookfield 1972a:30-1). For the colonial economy in the Territory of Papua and New Guinea, which was largely based on coastal tree-crop plantations, an abundant supply of cheap labor to perform the planting, tending, harvesting, and processing tasks required in the production of copra, cocoa, and rubber was absolutely essential. In fact, obtaining an adequate supply of labor was a persistent problem for the colonial planters. Mair (1970, Chapters 9-11) details the varied attempts made by the government administration to relieve the labor shortage. The discovery of the densely populated areas of the Highlands, then, opened up a potentially very productive resource zone of human labor.

The tapping of this resource, however, is a complex problem involving the total organization of the colonial thrust into the area. To entice workers to leave their resident communities and enter the wage labor force, some acceptable inducements must be offered. Naturally, these inducements are artifacts of the colonial economy, most importantly cash. For money to effectively mobilize a labor force, however, there must be a demand for it.

> The amount of money the members of a subsistence unit will want to earn will depend, to a very large extent, on the range of goods and services they can buy with it, on the price, and on the facility with which they can be obtained when and where they are wanted. Subsistence producers will be resident in the subsistence producing area, and what will matter to them most are the goods and services available where they live . . . the greater the utility of money to them . . . the more they will wish to earn (Fisk 1964:167).

To successfully convince subsistence workers that they should exchange some of their labor for cash, the colonial sector must solve the problem of providing the potential laborers with ready access to desired goods and services which can be obtained with cash. That is, they must create a demand for money. Brookfield summarizes the situation nicely:

> Hence it was necessary to pacify areas, develop a basic infrastructure, and create the conditions leading toward a demand for money, before a sufficient supply of labour could be tapped (1972a:51).

The dilemma faced by the colonial sector is straightforward: in order to recruit the labor force necessary for the expansion of the monetary economy, the benefits of that economy must be extended to the potential labor force.

This problem of creating a demand for money was attacked in two major ways, taxation and expansion of the retail distribution networks. The former was introduced in conjunction with the introduction of cash crops and the formation of local government councils. The latter has been carried out by privately-owned trade store companies and as auxiliary activities of planters and missionaries. The success of such a program, of course, depends on the development of a reliable and elaborate network of communication facilities. At present, this is a major limiting factor in expanding the national monetary economy and major projects, especially road construction, are being carried out in numerous areas of the country. More detailed discussion of these aspects of colonial expansion as they relate to Ilakia Village will be given below.

Even from the above highly simplified description of basic elements in the pattern of colonial domination, it is clear that the contact situation radically altered the sociocultural context in which the local Highland populations existed. Specific behavioral changes were demanded by the imposition of pacification and taxation, and new opportunities for acquiring valued commercial goods were presented by the cash crop and wage labor markets and the increasing access to retail stores. These alterations in the sociocultural environment of the Highland communities all emanate from sources external to the local communities and impose severe pressures on the extant village organizations. Compliance with the new orders and exploitation of the new resources demand significant changes in the strategic utilization of time, space, and resources controlled by the local groups. This dissertation explores the response of one community to stresses resulting from this initial phase of contact.

The Contact Period in Ilakia

At the time the research reported here was conducted, the Ilakia Awa had been in contact with representatives of the Australian government for about twenty-five years. While it is impossible to present the voluminous details of all changes occurring during this period, or to assess the total impact of these alterations on the data collected, a brief discussion of major events will provide some degree of orientation for the reader. Consideration will be limited to those external impingements which seem to have exerted the greatest pressures on the traditional management of basic resources. Specifically, this treatment includes contact with "foreigners," both expatriate and national, establishment of government control, wage labor employment, and the introduction of new crops.

About 1942, the people of the Lamari area had their first look at "men with different skin," when a small two-passenger Japanese fighter-bomber crashlanded along the banks of the lower Lamari River. According to Ilakian informants, the two Japanese fliers survived the crash and people from all over the region went to see them. An unexploded bomb laying near the crash site became the object of much attention by the local people who began beating on it with stones in an effort to break it up into small pieces to use for tools. Ignoring the protestations of the Japanese, the local men continued their efforts to smash the unknown object by dragging it with a vine to the edge of a cliff and pushing it over. The falling bomb exploded on impact and killed several men from the villages of Mobuta, Kaborape, and Ilesa, and one man from Ilakia who was visiting in Mobuta at the time of the crash. The two Japanese men were taken to a site near the now abandoned village of Kaborape, about midway between the present villages of Abomatasa and Awarosa. They lived there for about one month and were the subjects of frequent visits by the people from this area. When they felt strong enough to make the trip, they walked north to attempt contact with the Japanese lines in the Markham Valley.

While the men from Ilakia enthusiastically awaited an opportunity to go see the new men and their knives, hostilities with their enemies to the north prevented them from making such a visit until about 1945. At that time, a group of married men from Ilakia carried north to the Awa village of Tauna bird of paradise plumes and potassium salt, which they had obtained in earlier trading relations with villages to the south, and bows and arrows, which they had handcrafted. Bartering these items with men from Tauna and from the Auyana village of Nanggona, who had traditionally been the suppliers of shells and stone axes, the Ilakians obtained their first steel bush knife. Following the trading activities, five married men from Ilakia went to Auyana with the returning Nanggona men and accompanied a larger group of Auyana men to Kainantu for their first look at the white settlement there. No trading transactions took place in Kainantu and the trip was completed as rapidly as possible with only part of one day being spent in Kainantu. For the Ilakians, this was strictly a mission of curiosity as they had ventured further away from their own lands than anyone had ever been known to go.

On October 8, 1947, the first government patrol, under the command of Mr. R. I. Skinner, Assistant District Officer, arrived late in the afternoon at Ilakia and camped on the grassy ridge east of the village. This first visit by a white man sent all but the most able adult men scurrying to the opposite side of a nearby mountain. Carrying children, small pigs, and personal possessions, the frightened villagers spent the night in the grassland and returned to the village the next morning after the patrol had departed. Mr. Skinner noted that the men who met him were "nervous, although friendly" and that the "Lamari River villages are under no degree of control . . ." (Patrol Report, Kainantu, No. 5 of 1947-1948, p. 7).

During the next six years, only three government patrols passed through Ilakia. Each was greeted by a small number of friendly "agile males" who brought food to the patrol and were given sodium salt, cloth, beads, newspaper, mirrors, and shells in return. The first steel axe in Ilakia also was purchased from one of these patrols (probable date: September 1949 or May 1951) for the going price of one large pig. All the officers-in-charge of the patrols noted that such infrequent contacts by the government were unlikely to extend the knowledge of, or adherence to, the Pax Australiana. Beginning in September 1953, the government intensified its efforts to bring the Lamari River area under control and during the following nineteen years--i.e. to September 1972--25 patrols visited Ilakia and at least 13 additional patrols passed within a few hours walking distance and probably had contact with some Ilakians.

In February 1954, a patrol spent four days in Ilakia and attempted the first census. Only 77 names were recorded, however, and the disappointed officer-in-charge described the Ilakians as "truculent, churlish, arrogant, non-cooperative" (Patrol Report, Kainantu, No. 8 of 1953-54, p. 8). A stockade had been built around the village since the last patrol, the probable response to the killing of an adult Ilakian male by the traditional enemy village of Tawaina.

After leaving Ilakia, this patrol moved south to Mobuta to investigate a reported fight between that village and the Fore village of Abomatasa. While attempting to arrest participants in the fight, a man from the village of Tainoraba, who was visiting in Mobuta and had not been involved in the fight, was shot and killed after he attacked a policeman with a fence post while trying to escape arrest.[8] The following month, a patrol from Mumeng was fired on by Ilakians as it passed near the village (mentioned in an excerpt from the Mumeng Patrol Report contained in Patrol Report, Kainantu, No. 3 of 1954-55, p. 10).

In June 1954, a group of men from Ilakia made their first visit to the newly opened Patrol Post at Okapa. During this visit, one young initiated boy agreed to remain in Okapa to learn Neo-Melanesian as an interpreter trainee. This was very important to the work of the government in the area since without a Neo-Melanesian speaker among the Awa, they had to rely on multiple translations. The Ilakian boy remained at Okapa for only about four weeks before he returned to the village (Patrol Report, Kainantu, No. 3 of 1954-55, pp. 2, 12).

Intensifying efforts to control the Lamari River area, the government appointed the first Ilakian village official, called a "luluai," in July 1954. The task of the luluai was to act as a liaison between the government and the village by taking disputes between, or complaints from, the villagers to the government and pushing forward the programs of the government in the village. In these highly egalitarian groups, the job of the luluai was no doubt extremely difficult.

During the four days that this patrol stayed in Ilakia, they built a permanent government rest house which provides a shelter for various people who pass through the area. The construction was supervised by a "Goroka policeman" (Ilakians say he was from the Kamano region) who used flattened bamboo woven into a mat for the walls, complete with a criss-cross design (Patrol Report, Kainantu, No. 3 of 1954-55, p. 4). This house style gradually replaced the traditional "beehive" house with roof and walls of one continuous area of thatch.

When the next patrol visited Ilakia in November 1956, the rest house was still in good condition, but the village official was "uncooperative" and the other residents "very unresponsive" (Patrol Report, Kainantu, No. 6 of 1956-57). A census attempt yielded only 174 names.

Obtaining an accurate population census in Ilakia continued to frustrate the government. The problem was complicated by the lack of a knowledgeable Awa translator, the inability of one patrol officer to correctly pronounce names transcribed by a previous patrol, and the complex name taboo system followed by the Awa. Most Ilakians have several names which are given to them during their lives by various kinsmen. Some adult males have as many as four names and usually invent a new one specifically for the government census. By September 1958, two years had elapsed since the last census attempt and Ilakians had forgotten the names used on the previous occasion. The patrol officer had no recourse but to recommend that new census sheets be made (Patrol Report, Kainantu, No. 4 of 1958-59). It was not until June 1963 that a reasonably accurate census was taken with 242 individuals counted.[9]

During the visit to Ilakia in September 1958, a second village official, the "tultul," was appointed by the patrol officer. The job of the tultul was to mediate minor disputes--i.e. those not involving bloodshed--and to help organize the village to carry out the orders of the government. The programs receiving emphasis during this phase of contact were centered on denouncing physical aggression and improving the village health and hygiene. Anti-yaws injections were given to all Ilakians in March 1960 (Patrol Report, Kainantu, No. 8 of 1959-60) and triple antigen vaccine was given to all children under 5 years of age in February 1967 (Patrol Report, Okapa, No. 15 of 1966-67). Orders were given for the village to be fenced to keep pigs out,[10] for the construction (and, later, the use) of latrines, and for some individuals to build new houses. Progress in these projects was slow, but by February 1967, a patrol officer pronounced Ilakia as ". . . exceptionally clean with pig-proof fences" (Patrol Report, Okapa, No. 15 of 1966-67). An aid post was opened in Tauna Village in 1958 and staffed by a trained medical orderly. People in the area were reluctant to go for treatment and, in 1965, it was closed for ". . . lack of local cooperation" (Patrol Report, Okapa, No. 10 of 1964-65). Other aid posts were established in Kawaina #2 in 1966 (Patrol Report, Okapa, No. 5 of 1965-66), and in the Fore village of Abomatasa about 1970, but Ilakians say that they never visited either of these facilities. In early 1972, a new aid post was started in Mobuta which was highly recommended by a number of

Ilakians who went for treatment of minor ailments.

After some initial discord, relations between the government and Ilakia Village have been relatively harmonious. Ilakians have, however, maintained a degree of independence in prosecuting their grievances. During the visit of the patrol in September 1958, Ilakians refused to sell food because they felt payment received on previous occasions had not been adequate. The result was that eleven men, including the two appointed village officials, had their first extended visit of about two months duration in a white settlement as prisoners in the Kainantu jail (Patrol Report, Kainantu, No. 4 of 1958-59).

Intervillage disputes also have occasionally erupted into serious fighting. In early 1960, a bow fight with Mobuta resulted when an Ilakian man convinced a visiting married woman from Mobuta to remain as his wife. No injuries were sustained by either side, but several Mobuta men were jailed for their part in the hostilities (Patrol Report, Kainantu, No. 8 of 1959-60). The woman still lives in Ilakia with her chosen husband.

The second group of Ilakia men to be jailed were arrested in early 1962 after a bow fight with the Fore village of Abomatasa over an Ilakian woman who ran away from her husband and married a man in that neighboring village. Again in March 1968, a nearly identical incident resulted in yet another group of Ilakians spending several months on the prison work force in Kainantu and Goroka. By this time, the men realized what the consequences of their actions would be, but felt that the nature of the aggression against them demanded an immediate armed response.

The decision process of assessing the relative costs of violating government edicts as against those of not responding to perceived aggressions continues to the present. The government's system of litigation at the court in Okapa is considered slow and often unsatisfactory in its determination. Also, the fact that any person inflicting bodily injury will undoubtedly be the defendent is confusing to people who consider the only adequate redress for some grievances to be bloodshed. For example, the price of being caught performing sexual intercourse with another man's wife is having the aggrieved husband shoot an arrow into the leg of his wife's lover. It is the husband who does the shooting and it is he who will go to jail.

Another tragic example of the conflict between "government law" and "local law" occurred about two months after I left Ilakia. The guardian of my principle translator died and another man in Ilakia was accused of causing the death by sorcery. After several days, the young man who had worked as my translator ambushed the accused in his garden and killed him with the full knowledge, and in the actual presence of, several of the accused sorcerer's close relatives. When the body was discovered by the dead man's sister, the killer admitted the deed and walked to Okapa to report it to the government officials. According to reports received from Ilakians and from two other persons closely involved with the village, the killer is now serving an eight-and-one-half year jail sentence.

Contacts with Ilakia by persons other than those associated with the infrequent government patrols have been rather limited. In December 1959, Richard and Aretta Loving of the Summer Institute of Linguistics established a semi-permanent residence in the village of Mobuta and commenced study of the Awa language. In conjunction with their linguistic work and proselytizing activities, the Lovings also held small literacy classes in Mobuta and made periodic visits to all eight Awa villages. Largely due to their efforts, several young Ilakian men are capable of reading and writing simple Awa and Neo-Melanesian. Because of their extended period of residence and their fluent command of the Awa language, the Lovings' relationship with the Awa peoples remains unique.

In mid-1961, a black Kamano lay missionary was sent by the Lutheran Church to live in Ilakia. He was able to convince the people to build a small church, but wore his welcome very thin by relying on the villagers to supply him and his family with free food. In late 1962, a missionary colleague in Tawaina accompanied the men of that village on a raid of the village of Iyona and all lay missionaries were quickly withdrawn from the area by their superiors. The church and the house occupied by the man were subsequently torn down.

The first white man to take up residence in Ilakia was Dr. Philip L. Newman who conducted ethnological research in the village from August 1964 through July 1965. This was the first intimate contact with a white man for the villagers and was an experience which is still vividly recalled by all concerned. In June 1970, Dr. Newman made a return visit of nine weeks and was accompanied by Donald Runstrom and myself, both graduate students in anthropology.

Contact with whites and other Papua New Guinea peoples outside the village context commenced in March 1959 when four initiated unmarried youths decided to go to Kainantu to seek work. They had recently been caught eating a catfish eel, a serious violation of food taboos which caused them much embarrassment in the village. When a government patrol passed through the village, they accompanied it back to Kainantu. Upon arrival in

Kainantu, their greased and plaited hair was cut, their traditional bark string skirts were replaced by commercial shorts, and they were employed as gardeners by several members of the Native Constabulary. The young men received no wages for their efforts, but by the time they returned to the village in early 1960, they had acquired a rudimentary knowledge of Neo-Melanesian.

In May 1960, a patrol passed through Ilakia on its way to reconnoiter a site for what later became the airstrip at the Wonenara Patrol Post (Patrol Report, Kainantu, No. 7 of 1959-60). Two young men who had returned from Kainantu earlier in the year and had some knowledge of Neo-Melanesian were hired by the patrol as carriers and interpreters. These two men were employed in the same capacity on three other occasions the following year by patrols that were attempting to stop the continued fighting between the Awa villages of Mobuta, Amoraba, and Tainoraba south of the Lamari River (Patrol Reports, Kainantu, No. 10 of 1960-61, No. 1 of 1961-62, and No. 5 of 1961-62).

The first attempt by a large number of Ilakian men to enter the wage labor market occurred in the latter half of 1961 (ca. August to September). A group of ten young men walked to Wonenara to seek work on the construction of the new government station. About three weeks after their departure from Ilakia, the older men in the village became anxious about the safety of the youths, who had walked off into the territory of the feared Anga (Kukukuku) peoples, and so set out themselves for Wonenara. There they found the young men gainfully employed clearing a runway and constructing the buildings for the patrol post. The older men also were hired and worked for about one month before both groups returned to the village with earnings of A$3-5 for their labor.[11]

Ilakian men have continued to periodically seek employment as short-term casual laborers in the Highlands. Several groups worked on the construction of the Kainantu airstrip and many individuals have worked as coffee pickers during the peak season on plantations in the Kainantu area. Because of the low wages and the fear of assault at the job sites by numerically larger groups of workers from other areas, casual labor in the Highlands is an alternative now exploited most often by Ilakian youths too young and inexperienced to enter the agreement labor program.

In May 1963, the first group of Ilakian men were recruited by a patrol officer in the village and signed on as migrant agreement laborers under the provisions of the Highland Labour Scheme. Involvement in this program has continued to the present. It has been the largest source of cash and commercial goods for the village and has provided the most extensive contacts between Ilakians and culturally different peoples. A detailed analysis of this subject will be given in Chapter Four.

Many new food crops were added to the diet of Ilakians during the period remembered by informants alive in 1971-72. With the exceptions specifically noted below, all are said to have come along the traditional trade routes with the Auyana people to the north via the Tauna Awa. In the early 1930's, a variety of green beans was received, followed soon after by two additional varieties, and maize. With increasingly intensive contact, numerous vegetable crops were introduced in the 1950's, including seven more varieties of green beans, cucumbers, cabbage, pumpkin squash, green onions, and Irish potatos. Loving (1972) observed all of the above crops in the Awa region in 1960 plus tomatoes, which were used for playing kickball, but not yet consumed. Loving himself introduced pineapple and papaya into Mobuta village in the early 1960's and states that peanuts arrived during this time from the Fore reaching Ilakia via Mobuta. Xanthosoma taro was imported from Okasa in the mid-1960's and watermelon seeds were brought to Ilakia by returning labor migrants in July 1965. A lemon tree obtained in Tauna was planted in Opingkape hamlet in the late 1960's, but its fruit is still used only for target practice by small boys learning to shoot bows.[12]

According to James Sinclair (1972), District Commissioner, Eastern Highlands District, the early patrols in all areas of the Highlands distributed a wide variety of vegetable seeds. Ilakian informants confirmed that they were given seeds on many occasions by patrol officers, but said that they rarely planted any of them and never ate the resulting crops from those they did plant. They feared that these strange plants from an unknown place might cause sickness. One Ilakian man, after cautiously sharing a carrot with me from my garden, said that he had seen this plant before, but had never tasted it. Many years ago, a patrol officer had given him some seeds which he planted along the edge of a forest garden. When the mature tubers, like the one we had just eaten, were pulled out of the ground, people were afraid of them, so they disposed of these potentially dangerous plants by throwing them away at a burial ground site.

The only major cash crop among the Awa is coffee. Ilakians obtained the first coffee seedlings from relatives in the Fore village of Abomatasa about 1963. During Newman's residence in Ilakia, an agricultural officer from the Department of Agriculture, Stock and Fisheries (DASF) station at Aiyura visited the village and was surprised to find so little coffee planted. On a subsequent tripo to Aiyura with Newman, a young Ilakian man was given a sizable quantity of coffee beans for planting which he distributed in the village. Supplemented by beans and seedlings obtained by gift and purchase from various friends and relatives in neighboring communities, planting of coffee became widespread in Ilakia. By 1967, a few people had small amounts of coffee to sell and participation in the cash crop market commenced.

By 1972, 60 of the 73 Ilakian households had coffee gardens on Ilakian land. Three additional households had shares in joint gardens made with relatives in Abomatasa, but no area or tree count data are available for these plots. The total number of coffee trees in Ilakia in 1972 was 5900 of which 4360 were producing cherries. The remaining 1540 trees were planted, but not yet mature, and new plots continue to be planted. The importance of coffee and the details of its production in Ilakia will be discussed in Chapter Five.

The opportunities to convert cash earned by labor migration and the sale of coffee into commercial goods are still very limited for Ilakians. This is largely due to the complete lack of roads in the Awa area necessary for establishing viable retail outlets. At present, the nearest trade store is in the village of Okasa, a nine-to-ten-hour round trip on foot from Ilakia. This store is poorly stocked and on any given day may be completely sold out of the most desired items of food and clothing. A trip to the more reliable stores in Okapa requires a minimum of two days. To make goods more available to Ilakians, three young men have constructed small huts to serve as canteens, called "haus ketin" (see Maps 4 and 5). The operation of these ventures to date has been very sporadic and problematical. The would-be entrepreneur must first accumulate enough cash of his own, or convince several other individuals to pool money with him, to make the bulk purchases. The goods must be carried from Okapa to Ilakia and a payment in cash or goods be made to the carriers. If the prices asked for the goods are higher than those charged in the Okapa store, Ilakians boycott and verbally abuse the seller until he lowers the prices. In the actual exchange of money, errors frequently occur since even the most experienced Ilakians have great difficulty counting money and making change. The owners of the canteens also are subject to requests from friends and kinsmen to make gifts of various commodities. The result is that sponsoring a canteen is hazardous and attempted infrequently. From October 1971 through September 1972, two men stocked their canteens only once and the third man tried it twice. On all four occasions, the goods were sold out within a few days. The sponsors of three of these ventures claimed to have broken even, but one of them did not pay his carriers. The fourth effort ended in a net loss and the initiator said he would never try it again.

The incorporation of Ilakia Village into the expanding national government was attempted in February 1966, but the village declined the invitation to send a representative to the Okapa Local Government Council (Patrol Report, Okapa, No. 5 of 1965-66). However, in March 1967, the villages of Tauna, Tawaina, and Ilakia were designated Ward 40 of the Auyana Census Division, Okapa Subdistrict, and a councillor was elected from Tawaina to jointly represent them at the Local Government Council (Patrol Report, Okapa, No. 16 of 1966-67). The office of councillor, which places the "luluai" position as liaison with the government, is held for a two-year term and occupancy of the office rotates among the three villages comprising Ward 40. Each village elected a committeeman at this time who replaced the "tultul" officeholder.

Inclusion as a functioning unit in the national government meant not only participation in elections and a change in the titles of local officials, but the payment of taxes. Upon becoming members of the Local Government Council, an annual head tax was levied on each male 16 years of age and over (excluding elderly, nonproductive individuals). The Ilakian men were assessed A$2 each in 1967-68 and 1968-69, A$4 in 1969-70, A$6 in 1970-71, and A$7 in 1971-72 and 1972-73.[13] Of the 64 adult males in residence at the time of the tax patrol in September 1972, 52 paid the full assessment of A$7, and four elderly men paid a reduced amount of A$2 for a total of A$372. One man was excused from paying due to advanced age and seven men were unable to pay and were recorded as delinquent.

The financial burden of taxes is the source of much dissatisfaction in Ward 40 and with some reason. In June 1970, a patrol officer estimated the "annual income" of the Awa villages at A$5 per person (Patrol Report, Okapa, No. 29 of 1969-70). This estimated income is well below that for other wards in the Okapa Subdistrict who pay the same amount in taxes, but have much larger incomes from coffee production which is marketed on roads paid for from Council funds, including taxes. Another patrol officer noted the discontent in the Auyana Census Division over the unequal expenditure of Council funds. According to his calculations, the villages of the Auyana Census Division (which includes Ilakia) had paid A$9444 in taxes by February 1969 and had received only A$230 in capital works--a well at Asempa

Village that was no longer working (Patrol Report, Okapa, No. 17 of 1968-69).

Although some discontent and much confusion have been caused by the new responsibilities and opportunities presented in the initial post-contact period, Ilakians uniformly agree that the conditions of living have generally improved during this time. The older individuals, who vividly recall and take delight in telling stories about the "time of fighting," are the most emphatic in their support of the new conditions. During intensive periods of warfare, people made only a few gardens in relatively close proximity to the village, so food was often in short supply. The men took turns guarding the trails by day and by night, and visits to friends and relatives in neighboring villages were made infrequently. Now there are many gardens and plenty of food, and people are free to go where they wish. As one informant put it, "Before we were always afraid, but now we worry only about our children and our pigs."

Notes

1. Berndt (1952-53:202-203) records a similar response by the neighboring Fore people to the first sighting of an aircraft.

2. This model draws heavily from the work of Alland (1970, 1972), Alland and McCay (1974), Buckley (1967, 1968), Campbell (1965), Durham (1974), Gerard, Kluckhohn, and Rapoport (1956), Hainline (1965), Hamilton (1964), Lewontin (1970), and Nett (1953).

3. Mair (1970) and Reed (1943) give quite detailed historical coverage of major programs and policies pursued by the Australian administration.

4. Interesting accounts of these early patrols are given by participants in Leahy and Crain (1937) and Taylor (1938-39), and by others in Mair (1970), Sinclair (1966, 1969), Souter (1963).

5. Narrative accounts of various violent encounters experienced by early explorers and officials are given in Sinclair (1966), Souter (1963), and Hides (1936).

6. Souter (1963:187) reports that in the Mandated Territory of New Guinea, 57 "natives" and one German miner were hanged for criminal offenses between 1925 and 1936.

7. In discussing the unusual hostility encountered by Jack Hides on a patrol in 1935, Souter observes: "Spontaneous treachery is unusual on first contact with primitive people, and it seems possible that if Hides had not found recklessness so pleasing . . . this first patrol across the great Papuan Plateau would not have been as bloody as it was. One suspects that Karius and Champion, if it had been their patrol, might have reached the Purari without firing a shot" (1963:169).

8. Actual documentation of this incident was not available since deaths at the hands of patrols are not reported in the public documents. The patrol report, however, does note that all events occurring in Mobuta from 14-16 February 1954 are reported in the following documents: Confidential Memorandum 31/1/155,

23 February 1954, Kainantu Memorandum 31/1/159, Goroka Memorandum 30/1/444, 8 March 1954, and Headquarters Memorandum DS11-1-88, 29 March 1954. Based on other events that were reported during this patrol and checked against Ilakian informants' statements, there is little doubt that this was the patrol involved in the shooting. Further evidence is afforded by a note in Patrol Report, Kainantu, No. 3 of 1954-55, p. 4, which relates a similar version given by Mobuta residents. This patrol report also refers to a statement by the Mumeng patrol that passed through the area in early March 1954 and received complaints from Tainoraba villagers that a recent patrol had killed one of their people.

9. This compares quite well with the census recorded by Newman (1964-65) of 256 in July 1965 while he was a resident in Ilakia.

10. Boyd (1974) examines the impact of village fencing on pig husbandry practices in Ilakia.

11. All monetary units are given in Australian dollars (A$0.95 ≈ US$1.00).

12. For comparison with the chronology of crop introductions among the neighboring Fore people, see Table II by D. C. Gajdusek and M. Alpers in Alpers 1965: 78-80.

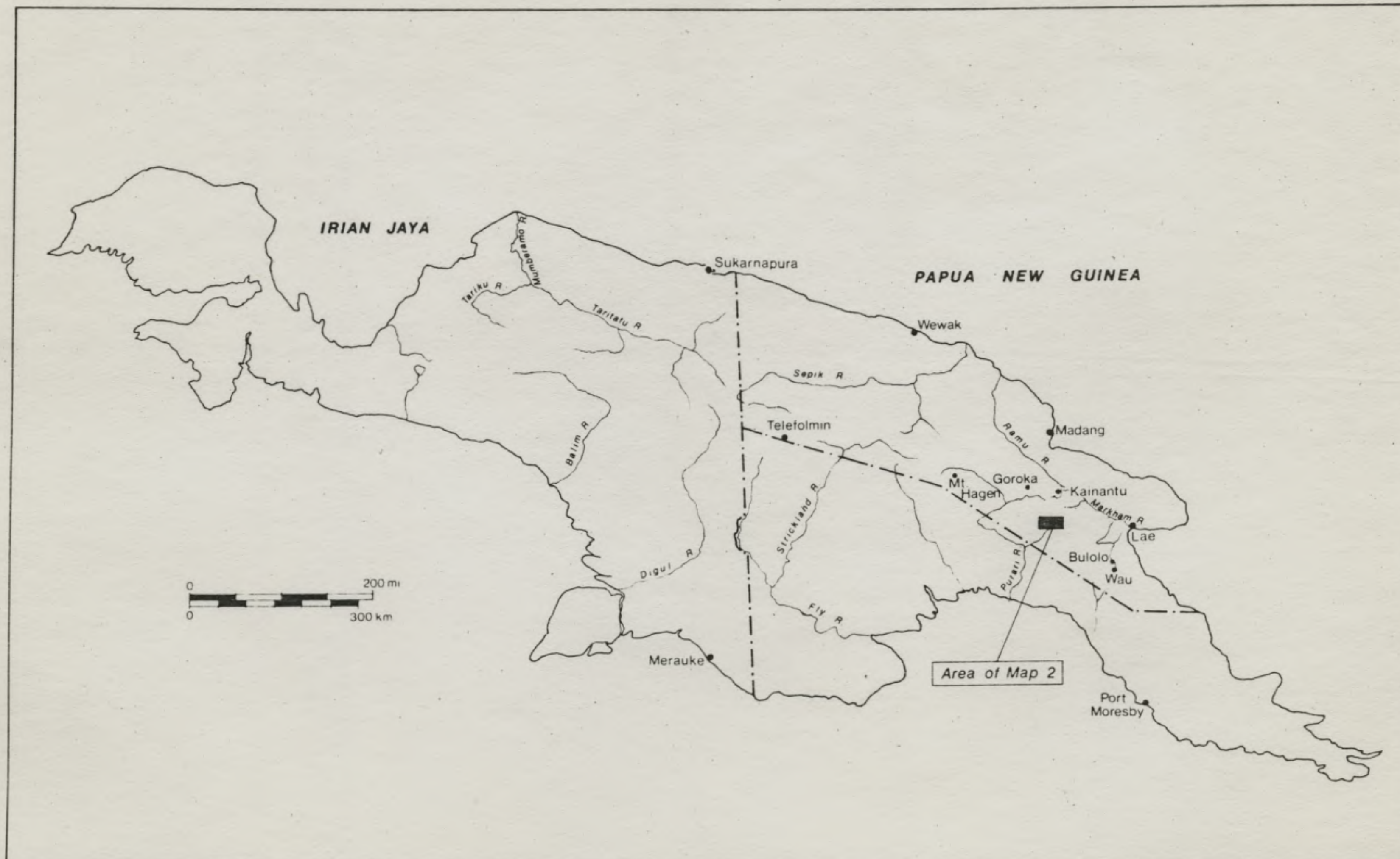
13. Patrol Report, Okapa, No. 18 of 1969-70 states that 1970-71 taxes for Ward 40 would be A$4. Ilakian informants, however, claim that because they did not go to Tauna to pay their taxes on the appointed day, they were assessed the full A$6 at a later date. This information was not confirmed with government officials, so the exact amount paid for 1970-71 is open to question.

CHAPTER TWO

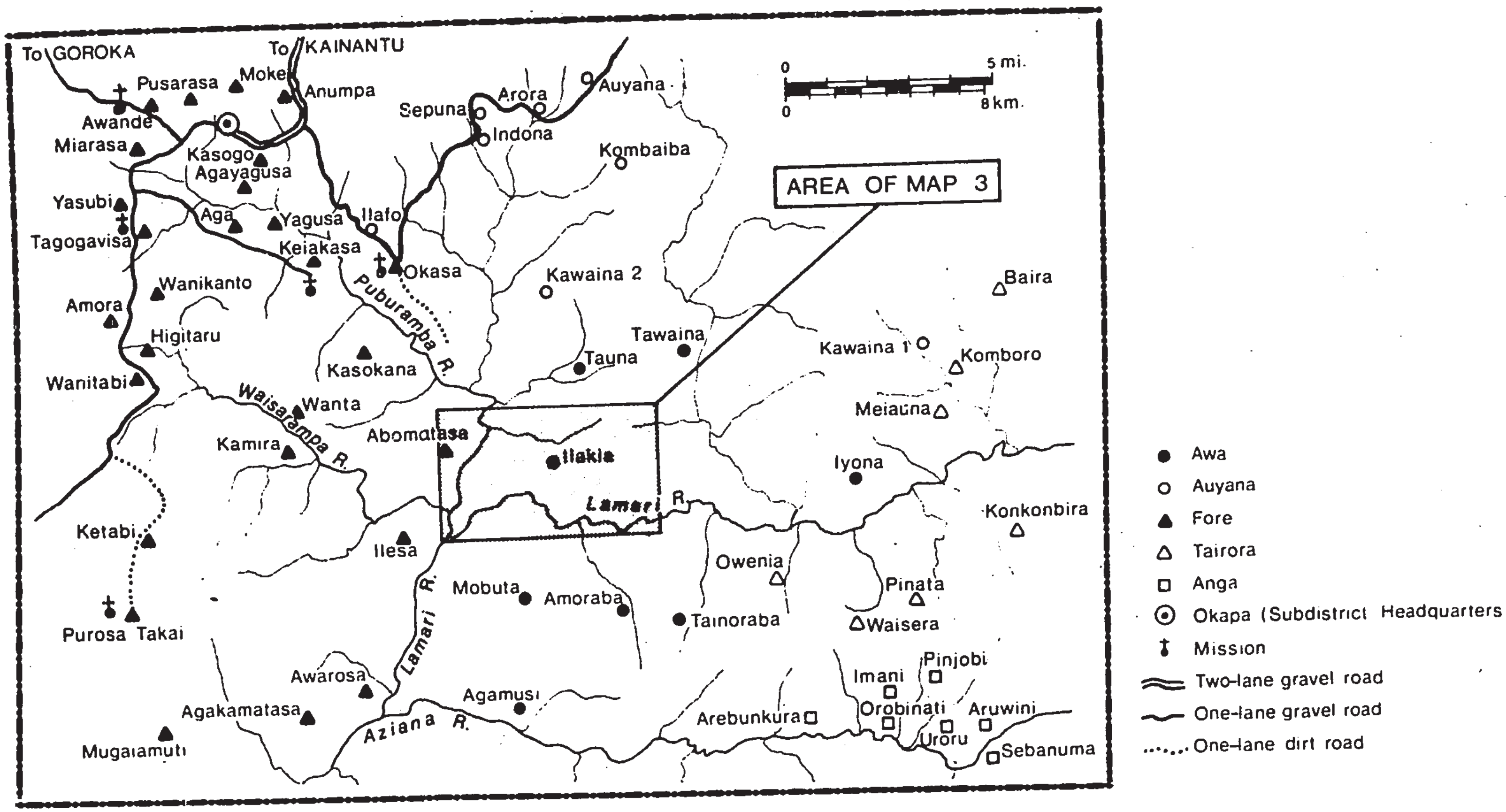
THE RESEARCH SETTING

The Ilakia Awa are situated in the southeastern corner of the Auyana Census Division of the Okapa Sub-district, Eastern Highlands District, Papua New Guinea, with the approximate geographical coordinates of 145°43'E and 6°38'S (See Map 1). This location places village lands on the northern slopes of the Lamari River[1] just northeast of the confluence with the Puburamba River (See Map 2).

The landscape of this area is dominated by the rugged peaks of the Kratke Range and the deep gorges cut by swift-flowing rivers through the surface sandstone exposing underlying layers of volcanic rock. Slopes of 45 degrees are not uncommon and in some places the measured angle of ascent exceeds 60 degrees (Pataki 1968: 101). The river courses in the area are bordered by gallery forest which gives way to the kunai grassland that covers the valley floor and slopes up to about 5,000-5,500



Map 1: THE ISLAND OF NEW GUINEA

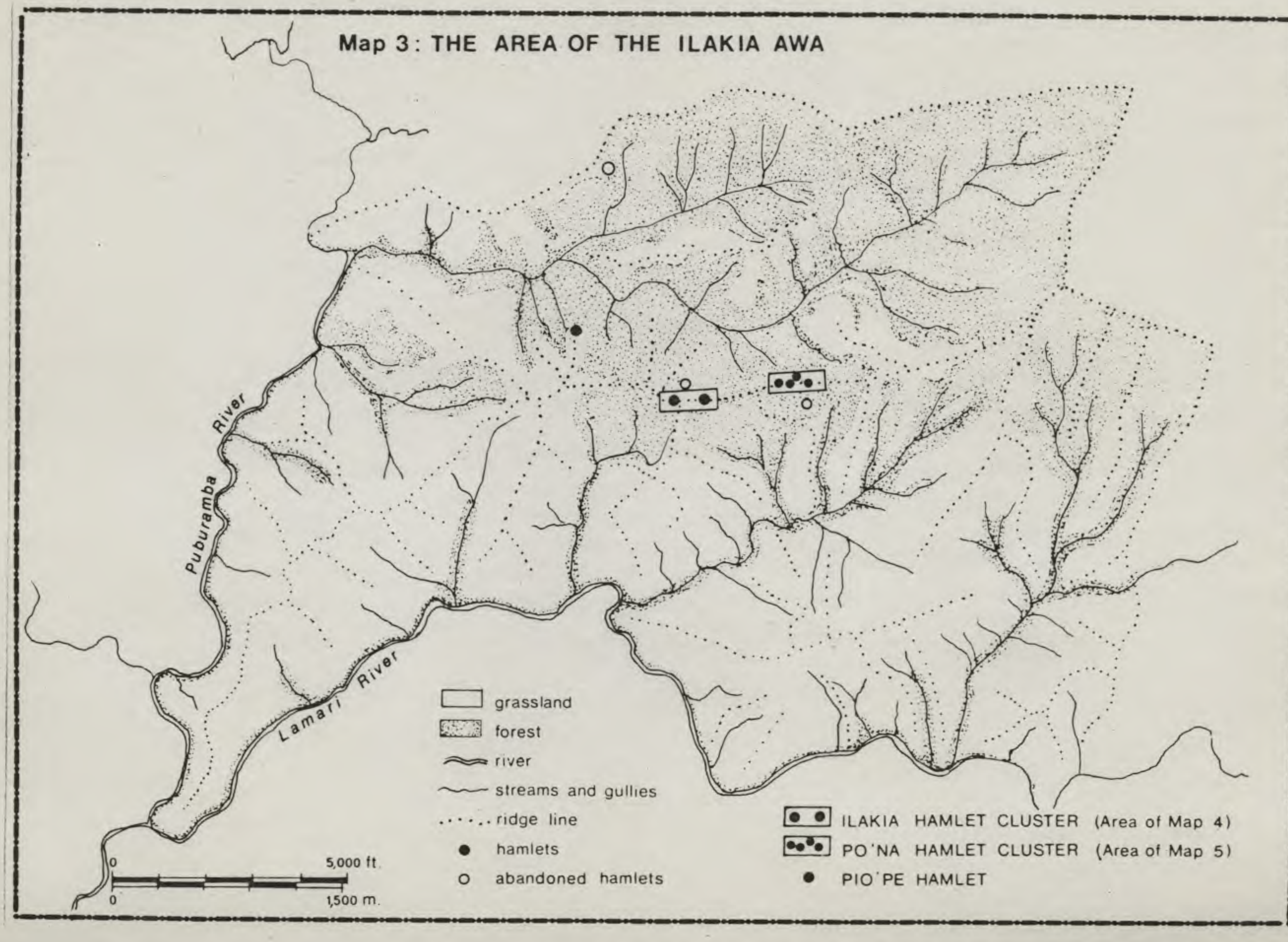


Map 2: THE AREA OF THE AWA

feet above sea level. The extensive grassland of the Lamari River valley, which likely results from human activity (Robbins 1963, Sorenson 1972), causes a marked break in the dense montane forest which covers the hill-tops and extends relatively unbroken to the north as far as the Kainantu valley, a distance of about forty miles. It is the extreme southern tip of this vast forest that the Ilakians control together with the grassland that extends down the slopes to the Lamari River (See Map 3).

Spatial Distribution of Resources

The spatial distribution of resources controlled by the Awa-speaking peoples is largely determined by altitudinal factors and the impact of human exploitation which continues to force the recession of the forest boundary. The formidable nature of the terrain is attested to by the change in elevation which varies from about 3000' at the confluence of the Lamari and Puburamba Rivers to 7300' on the highest peaks.[2] Pataki (1968:36) estimates that of the 78 square miles of land belonging to the Awa, 6.4 percent (5 square miles) lies between 7000-8999', 87.2 percent (68 square miles) between 4000-6999', and 6.4 percent (5 square miles) between 3000-3999'. Using the major floral dichotomy of forested/non-forested (with "forested" defined as land where "75% of surface



Map 3: THE AREA OF THE ILAKIA AWA

is in primary or mature secondary forest" [1968:33]), he also calculates that 28.2 percent (22 square miles) of Awa land is forested with the remaining 71.8 percent (56 square miles) classified as non-forested--i.e. kunai grassland (1968:33).

The "bush"/kunai distinction is certainly the most striking floristic division in the area, but these major zones exhibit some important internal variation.[3]

The bush is two-tiered Lower Montane Rain Forest with the canopy reaching heights of 80-100 feet and a spongy humus layer underfoot. It is largely dominated up to an altitude of about 6000' by various genera of oak (especially Castanopsis, Quercus, and Lithocarpus). In the damper areas of this zone, along the streams and in the gallery forest, the undergrowth is more dense and the towering hoop pine (Araucaria cunninghamii) and several other genera (especially Elaeocarpus, Ficus, Piper, Pandanus, and Casuarina) compete more successfully with the oak. Above 6000', the oak gradually give way to species of the southern beech (Nothofagus) which dominate the 90-110 foot canopy. Throughout the forested zone, other trees of various heights are intermixed and epiphytic ferns, orchids, mosses, liverworts, and small ground-level herbaceous plants are abundant. Numerous stands of wild and cultivated bamboo also are present.

The mature kunai grassland is dominated by species of Imperata and Themeda mixed with other grasses (especially Ischaemum, Arthraxon, Setaria, and Miscanthus). Hays (1974:60) notes that in the Ndumba (Habi'ina) area of the Upper Lamari, the dominant species seems to fluctuate with the degree of slope and the depth of the topsoil. Themeda australis occupies the steeper hills with a thin layer of soil while Imperata cylindrica covers the less precipitous slopes with deeper soils. Occasional small shrubs (e.g. Crotalaria, Hypericum, Pipturus, and Rhododendron) and tree ferns (Cyathea) also occur in the grassland, especially in protected depressions.

Fallowed garden plots exhibit distinctive floral compositions although these immature associations are highly influenced by the adjacent mature communities. All recently abandoned gardens, except those high in the forest, are easily recognizable by the fuzzy white plumes of the dominant swordgrass (Miscanthus floridulus), the sharp-edged blades of which will quickly inflict numerous small cuts on the exposed skin of an unwary intruder. Where a pattern of forest regrowth occurs, numerous shrubs and small trees (e.g. Acalypha, Dodonaea, Ficus, Macaranga, Rhododendron, Saurauia, and Schuurmansia) successfully compete with the swordgrass and the dense growth of various herbaceous weeds. In plots which border the grassland, however, forest regrowth is retarded and occasionally terminated. Fewer small trees and more shrubs (e.g. Solanum) and tree ferns (Cyathea) occur in these locations and the grassland Imperata and Themeda associations gradually return.

The soils of this region are tropical lithosols composed of porous, iron-rust colored laterites and compact clays. The lateritic topsoil is easily crumbled--i.e. friable--and acidic with a pH of 6.0 and less (Pataki 1968:29). The thin covering layer of humus varies in depth from a fraction of an inch to several inches with pockets of alluvial soil becoming larger and more numerous as one proceeds down the hillsides. The forest floor is covered with several inches of moist decaying organic material which contributes to the dampness and earthy smell characteristic of this zone. The topsoil is loose and easily penetrated by a digging stick. The ground in the grasslands has very little organic debris on the surface. It is washed by the frequent rains and baked by the intensive sunlight to form an extremely tough layer which is reinforced by a dense network of shallow roots from the various grasses.

The distribution of fauna also differs markedly between the forest and grassland zones. The forest contains numerous marsupials (wallabies, tree kangeroos, phalangers, gliders), rodents, feral pigs, and an occasional cassowary,[4] all of which are exploited by hunting and a variety of traps. The nocturnal marsupials are hunted at night by single individuals or small groups of men, often using dogs. The frequency of such hunts increases at full moon during the dry season when visibility is good and the hunter is less likely to be drenched by a sudden shower. The numerous bird species present in the forest are casually hunted almost daily by men and boys walking through the bush. For daytime hunting during the dry season, bird blinds are built to conceal the hunter near small artificial watering pools made by damming a small brook and covering the surrounding water with branches. This riparian zone supports small frogs, several kinds of crustaceans, and ground-dwelling beetles, all of which are eaten. A small, harmless tree python also inhabits the forest. Among the most desired foods of the bush are the larvae of various species, some of which are 3-4 inches in length. These are found in decaying logs and burrowed under the bark of trees. Occasionally, the bark of selected trees is stripped off to encourage larval infestation.

The grassland is much poorer in faunal resources. The bandicoot and several rodents are found there, along with various birds, beetles, and flying grasshoppers. A highly poisonous viper, called the death adder, also inhabits the kunai area and poses a considerable danger. During 1971-72, a young boy died from the bite of this snake, two adult men were bitten, but survived, and six pigs were found dead with the distinctive double-fang wound.

The larger rivers and lower portions of smaller streams contain small scaled fish and catfish rarely exceeding six inches in length. These are caught by women using circular dip nets made of knotted bark string and by men using bows and four-prong arrows. Recently, hook-and-line fishing has become very popular with the men. Large catfish eels also inhabit the rivers. These are occasionally taken with strong steel hooks and heavy nylon line, but are more successfully trapped in bark containers baited with large grubs. The largest eel caught during 1971-72 measured 8 feet in length and weighed 20 pounds.

Temporal Distribution of Resources

In assessing the resource availability of a given geographical area, an important consideration is the temporal variability of environmental productivity. Various climatic factors strongly influence reproduction and growth characteristics of plant and animal species which result in periodic and, occasionally, aperiodic fluctuations in the availability of biotic resources. Human populations, like other living species, must possess the capability of adjusting to such productive shifts in order to survive indefinitely. Necessarily, the organization of all human groups includes mechanisms which afford a degree of behavioral flexibility necessary to override anticipated variations in critical resource availability. The specific organizational characteristics utilized by the Ilakians will be discussed in detail later.

While irregular, aperiodic fluctuations--e.g. floods, severe droughts, frosts--which cannot be anticipated with precision, certainly have the most drastic impact in biotic communities, information on their frequency in the study area is minimal and they will be largely ignored here. The regular, periodic fluctuations that occur vary in temporal duration from the 24-hour diurnal-nocturnal cycle to the long-term shifts in temperature and precipitation regimes which evidently span several millenia. The most important of these for this study is the twelve-month cycle of seasonality .

Seasonal variations in temperature are insignificant in Ilakia. The range of temperatures occurring daily, which varies from average daytime highs in the high 80 degrees Fahrenheit to nighttime lows in the low 50 degrees Fahrenheit, exhibits greater fluctuation than the range of average daily temperatures over the annual cycle. During the "dry" season of June through August, when cloud cover is more often light or absent, the daily maxima and minima are occasionally more extreme with highs in the low 90 degrees and lows in the high 40 degrees. Frost is said to never occur in Ilakia.

The pattern of variation in precipitation is influenced by the monsoon conditions of the Western Pacific. During the summer months of the Southern Hemisphere (ca. October to April), the northwest monsoons from Southeast Asia produce relatively heavy rainfall. This condition is reversed during the southern winter (ca. May to September) when the southeastern monsoons result in relatively dry weather (Brookfield 1966:53-61; Pataki 1968:28). This "dry" season is indeed relative. Measurements taken by Hayano in the Awa village of Tauna during one twelve-month period in 1969-1970 show that during only three months--i.e. June and August 1969, and January 1970--was rainfall less than three inches (1972:25). Total precipitation during this period was 78 inches.

Variations from one year to the next in the amount of rainfull also occasionally exhibit extreme deviations from the monthly means. These irregular fluctuations can cause hardships for human populations as was evidenced by the winter drought and severe frosts that hit parts of the highland area during 1972. Although Ilakia was less seriously affected than other areas, particularly the Western Highlands, this unusually dry winter was climaxed by a sixty-day period from 22 July to 21 September during which no precipitation fell in Ilakia. While this drought did not have serious consequences on the food supply in Ilakia, most of the recently planted sugarcane, bananas, and leafy greens had to be replanted.

With the above qualifications in mind, the pattern of rainfall for this area, as recorded in Okapa from 1959-1963 and reported in Brookfield and Hart (1966, Appendix ii, Table 1), shows a definite trimodal distribution for this five-year period. Although the mean annual rainfall of 86.7 inches and the fact that no monthly average falls below four inches defines the Awa area as a relatively wet climate, the seasonal variation in precipitation is not without importance. As Clarke observes in the Ndwinba Basin:

> Undeleterious though they probably are to the productivity of crop plants, the drier season and its accompanying dry spells have relevance to the Bomagai-Angoiang agriculture: burning of felled debris is easier; there is less leaching of ash and of the nutrients accumulated in the soil that is exposed by cutting away the forest; and garden work is less frequently interrupted by rain than at other times of the year (1971:46).

These factors are important in the timing of the annual cycle of subsistence agriculture in Ilakia, a topic which will be dealt with in detail below. Activities other than those directly related to agriculture also are influenced by this general pattern of annual rainfall. As noted above, fishing is engaged in only during the drier season when the rivers are at the lowest levels. Bird hunting from blinds is more productive during this period because the number of pools along the spring-fed brooks is greatly reduced. The clear nighttime skies improve visibility in the forest and men more frequently venture out on overnight hunts for nocturnal marsupials. The drier trails and more easily forded rivers make communication between villages less problematical so that intervillage visiting and trading missions are more often undertaken.

Neighboring Groups

Linguistic groups bordering the Awa territory are the Auyana to the north, the South Tairora to the east, the Anga (Kukukuku) to the south, and the South Fore to the west (See Map 2). Traditionally, contact with each of these neighboring groups was mostly confined to particular Awa villages sharing contiguous boundaries. For example, Ilakia had long-standing trade relationships with the South Fore villages of

Abomatasa, Ilesa (Iraba), and Wanikanto exchanging black palm bows and arrows for piglets and feathers. Occasional intermarriage also occurred. Ilakia, however, had infrequent contacts with Auyana peoples, and these usually occurred with the Tauna Awa acting as intermediaries. The Ilakians brought bows and arrows, salt, and feathers, and received stone adzes, shells, and piglets (Cf. Robbins 1970:29). The Anga and South Tairora groups, who traded feathers and their famous salt (See Godelier 1971) to their Awa neighbors in exchange for bows and arrows, axes, and shells, were known to the Ilakians only by hearsay. Of the Ilakians living in 1971-72, none had ever visited a Tairora or Anga village except as part of a recent European patrol.

The Awa language,[5] classified as a member of the Eastern (Kainantu) Family, East New Guinea Highland Stock, East New Guinea Highland (Micro-) Phylum (Capell 1962, Wurm 1961, 1964) is spoken by only eight communities. Seven of these villages are located along the Middle Lamari River and the eighth is across the ridge south in the Aziana River Valley (See Map 2). According to government census figures from 1961-63, the combined total Awa population was 1292 individuals (Littlewood 1972:20), a figure which probably errors in the direction of underestimation. As Littlewood (1972:28) and Hayano

(1972:130) both acknowledge, government census figure for the Awa during this time period undoubtedly were subject to omissions since some individuals still hid in the bush when patrols were present, a response also readily admitted to by Ilakian informants. Pataki (1968:105) lists census data from 1963 which are more detailed and very likely more accurate. The total Awa population sums to 1374 individuals with the following breakdown by communities:

Ilakia	242
Tawaina	238
Tainoraba	233
Agamusi	206
Mobuta	171
Tauna	139
Amoraba	103
Iyona (Oguratába)	42

It is safe to assume that the relative sizes of these villages has been maintained to the present. In 1971-72, the total Awa population was approximately 1500 persons (McKaughan 1973b).

The degree of contact between Awa villages seems to be directly related to distance, measured in hours of walking time.[6] Ilakians make frequent visits to Tauna and Tawaina (2-1/2 and 2 hours respectively) and, though less frequent, have numerous contacts with the people of Tainaraba (6 hours), Amoraba (5 hours) and Mobuta (5 hours). Elders in Ilakia, however, could only remember a single visit by a small group of Ilakian men to each of the Awa villages of Iyona (6 hours) and Agamusi (7-1/2 hours), the latter in the company of friends from Mobuta.

The lack of intensive contact between Awa communities is evidenced by the linguistic subdivisions. Loving (1973a) identifies four dialects of the Awa language: 1) Tauna, 2) Ilakia, 3) Northeastern, consisting of Tawaina and Iyona, and 4) Southern, including Tainoraba, Amoraba, Mobuta, and Agamusi. The percentage of cognates between pairs of communities varies from 71 percent for Tauna-Agamusi to 98 percent for Tainoraba-Amoraba.

> Awa speakers not only easily recognize but also point out to the investigator specific differences in pronunciation between village dialects with even the highest percentage of shared cognates. On the other hand, there appears to be mutual intelligibility between even the most divergent dialects, and speakers in any one Awa village will name the other seven villages as those which are *mota ehweh* "one talk" (Loving 1973a:6).

The location of Awa villages is characteristically high on the valley flanks inside the secondary forest near the grassland boundary. Reasons for the selection of specific village sites, however, are not clearly understood. Littlewood suggests both social and physiographic factors:

> In Awa and southern Tairora, warfare and the terrain may conspire to create the ridgetop village which occupies the only *defensible and level* part of the landscape (1966:103; italics in original).

Ilakian informants did note the importance of both of these factors, but they are neither necessary nor sufficient causes. Level plots of land are rare and small in size throughout the Awa area, including ridgetops. To provide level bases for house construction, most sites require moving substantial amounts of earth by hand or building a raised platform which serves as the floor. The defense of the village appears to have been more dependent on careful guarding of trails and maintaining a pallisaded perimeter surrounded by dense stands of reeds than on an elevated location. During intensive fighting with the Tauna Awa, the Po'na hamlet cluster of Ilakia Village actually moved off the ridge to a now abandoned site south of the present location (See Map 3). In fact, of the six Awa villages visited, only one hamlet of Tawaina, one of Tainoraba, and the two hamlet clusters of Ilakia can possibly be considered as occupying "ridge-top" locations.

Most Awa communities are composed of several dispersed groups of houses or hamlets. Of the eight villages, only Amoraba and Iyona have but one residential site.

To denote these village-level populations, Pataki has offered the term "bounded complex" which he defines as "<u>the largest aggregate of people with a sense of common</u>

identity recognizing common access to a continuous unit of land" (1968:51; italics in the original). The stated purpose of this formulation is to emphasize the importance of common residence and shared territory, rather than kinship, as organizing principles for these groups. Keeping this fact in mind, the terms village, community, and bounded complex will be used interchangeably in this discussion to indicate the top level of the residential units hierarchy.

The Bounded Complex of Ilakia

The land belonging to the Ilakia Awa totals approximately 21.4 square kilometers (8.3 square miles)[7] of which 60 percent is kunai grassland and the remaining 40 percent is secondary growth and altered primary forest.[8] This yields a forested:non-forested ratio of 1:1.5, a value showing a higher proportion of bush in Ilakia than the 1:2.55 ratio, calculated by Pataki (1968:34), for the Awa region as a whole. The distribution of these two major ecological zones in Ilakian territory is presented on Map 3.

The total population of Ilakia in October 1971 was 267 consisting of 141 males and 126 females, a male:female sex ratio of 112:100. This yields a gross population density of 12.5 persons per square kilometer

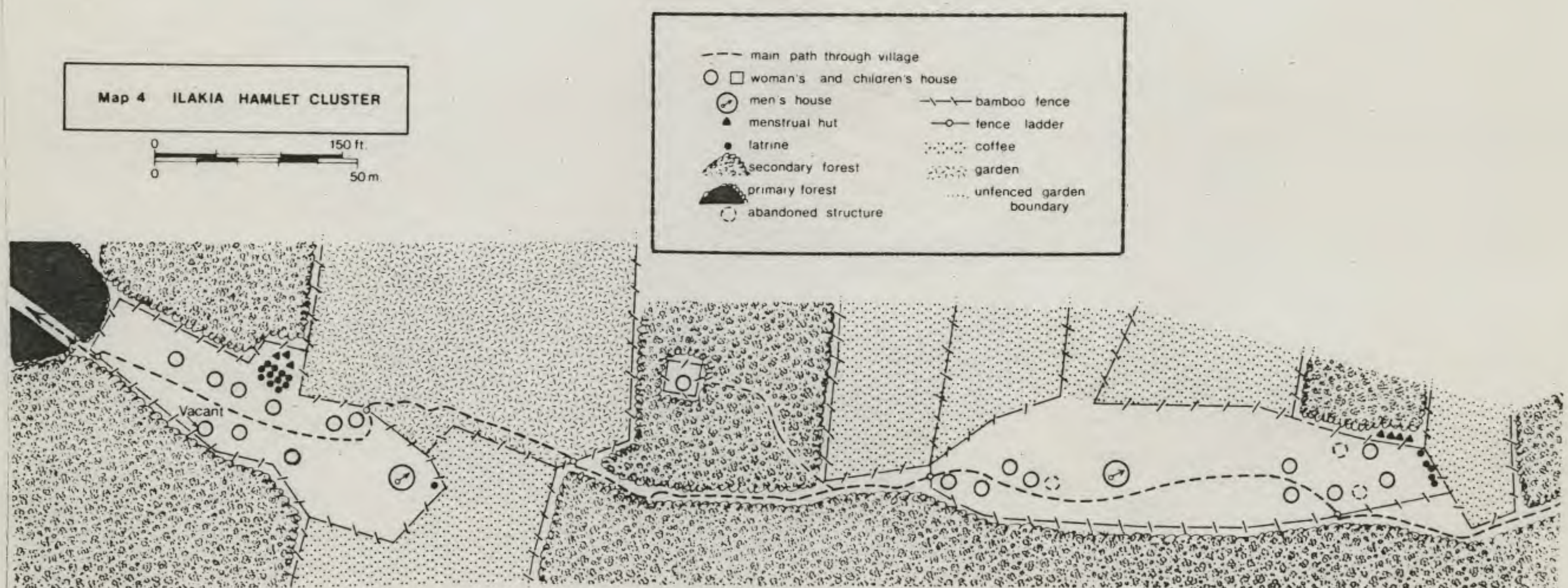
(32.2 persons per square mile). If the 1963 census figure of 242 is assumed correct, this means that during the eight years from 1963 to 1971, the Ilakian population increased at an average of 1.25 per cent per annum, a doubling rate of once each 56 years. During the twelve months from 1 October 1971 to 30 September 1972, the total population of Ilakia increased to 273 persons (144 males, 129 females). This net increase of six resulted from 13 births (5 male and 8 female), two permanent immigrants (1 male and 1 female), 8 deaths (3 male and 5 female), and one permanent emigrant (female).

The number of actual residents in Ilakia in October 1971 was reduced from 267 to 246 (120 males, 126 females) by the absence of 21 adult male migrant laborers. During 1971-72, the resident population was augmented by six individuals, resulting from the combined effects of natality, mortality, immigration, and emigration, plus two returned migrant laborers. Therefore, on 30 September 1972, the total resident population of Ilakia was 254 (125 males, 129 females).

The bounded complex of Ilakia is situated along the crest of a mountain spur at about 5000' (See Map 3). It is subdivided into seven hamlets each named for the piece of land it occupies. Six of the seven hamlets are grouped into two hamlet clusters called Po'na, which

includes the hamlets of Opingkape, Napaitape, Kuritape, and Po'nape (See Map 4), and Ilakia, which includes the hamlets of Nongautepe and Tanaidape (See Map 5). The seventh hamlet, Pio'pe, is located about 500 yards northwest of Ilakia hamlet-cluster and off the main ridge occupied by the other hamlets (See Map 3). Each hamlet is composed of a number of houses for women and children and five of the seven hamlets also have a men's club house. The number of residential structures and the resident population for each hamlet is given in Figure 1.
Of the total of 58 residential structures occupied by women and children, 32 contain members of a single household unit, 19 contain members of two household units; two household units occupy two structures each, and the only polygynous household in the village is divided among three structures.

The nature of social groups in the Highlands of New Guinea is the subject of a lengthy and continuing debate. Indeed the very existence of identifiable social groups outside the theoretical constructs of anthropologists has recently been questioned by some investigators (Watson 1970, Wagner 1974). Most of the controversy, however, has centered on the extent to which common ancestry is employed as a principle of group membership. Barnes, in attempting to summarize the early phase of this



Map 4 ILAKIA HAMLET CLUSTER

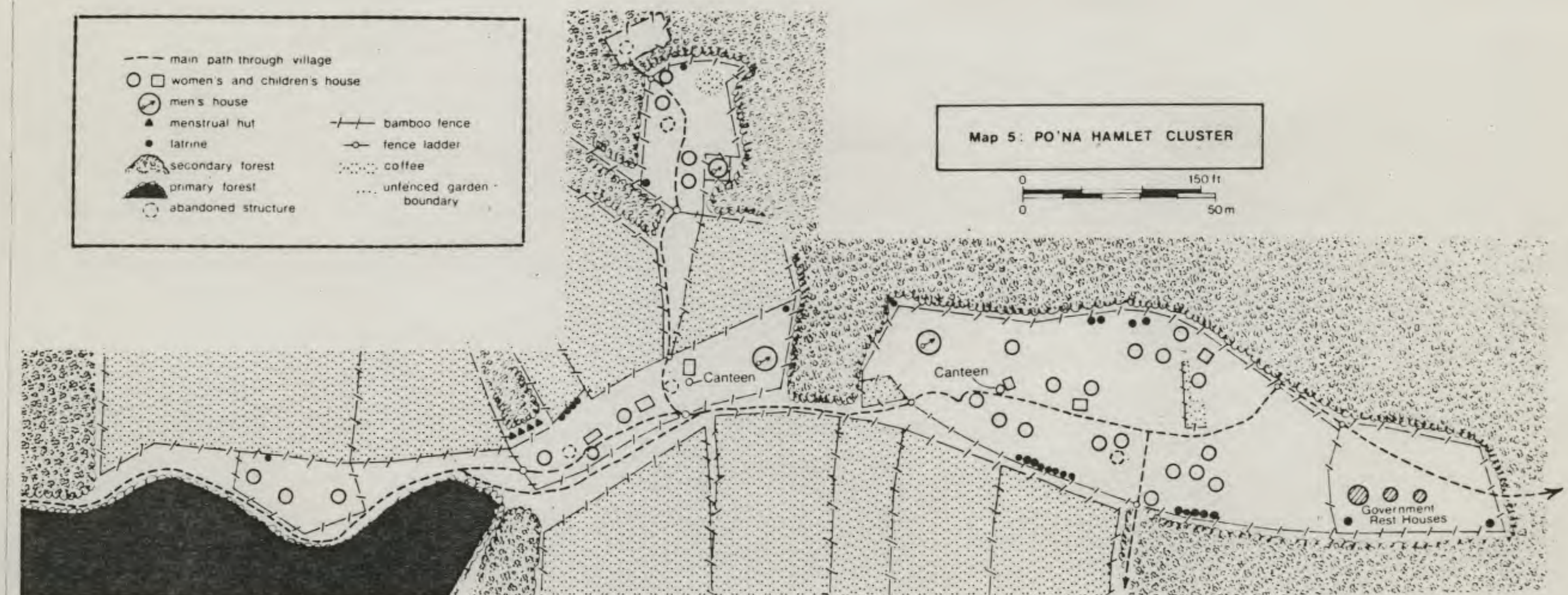
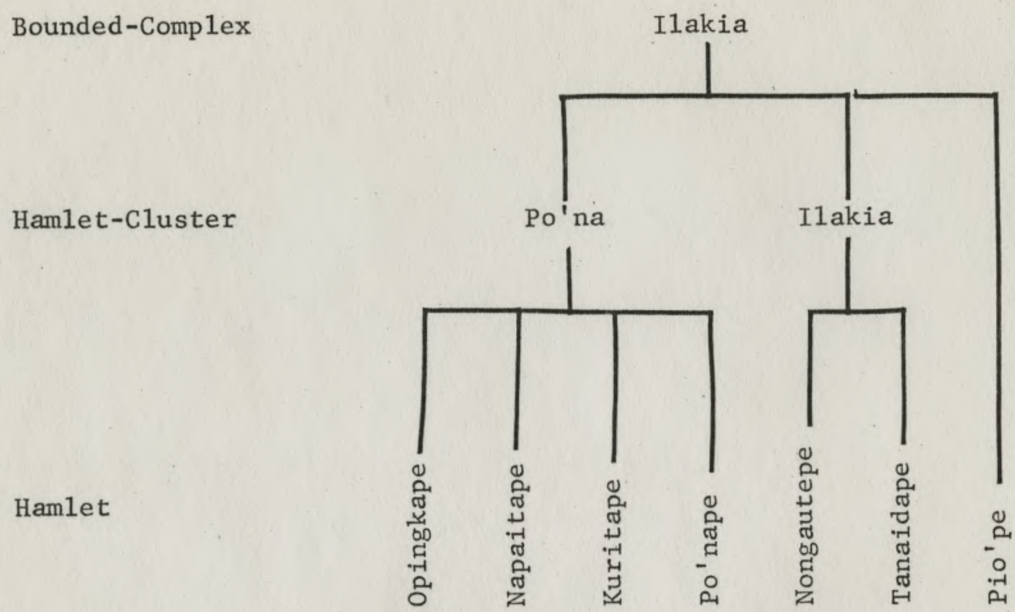

main path through village
women's and children's house
men's house
menstrual hut
latrine
secondary forest
primary forest
abandoned structure
bamboo fence
fence ladder
coffee
unfenced garden boundary
Map 5: PO'NA HAMLET CLUSTER
0
150 ft
0
50 m
Canteen
Canteen
Government Rest Houses

FIGURE 1: HIERARCHY OF RESIDENTIAL UNITS, ILAKIA VILLAGE.



	Opingkape	Napaitape	Kuritape	Po'nape	Nongautepe	Tanaidape	Pio'pe		
# of Residential Structures Occupied	20	7	4	3	10	8	6	=	58
# of Men's Club Houses	1	1	1	0	1	1	0	=	5
# of Households	26	7	6	4	14	9	7	=	73
Resident Population (1 October 1971)	80	27	16	20	41	36	27	=	247
Individuals Absent as Migrant Laborers	7	1	1	0	9	2	0	=	20
Total Population	87	28	17	20	50	38	27	=	267

debate, pointed out that idealized models of African groups, which postulated descent as the sole criterion of membership, do not accurately describe most Highland groups with the Mae Enga being a possible, though debated, exception (Meggitt 1965; cf. Barnes 1967, McArthur 1967).

> Clearly, genealogical connexion of some sort is one criterion for membership of many social groups. But it may not be the only criterion; birth, or residence, or a parent's former residence, or utilization of garden land, or participation in exchange and feasting activities, or in house-building or raiding, may be other relevant criteria for group membership (Barnes 1962:6).

The multiplicity of criteria for group membership poses a formidable problem:

> . . . we are hard put to decide, for example, whether descent groups are mainly agnatic with numerous accretions, or cognatic with a patrilineal bias (Brown 1962:57).

This problem, however, is based on a failure to distinguish between the "ideology", "dogma", or "jural rules" of descent expounded by the group members and the statistical norms of "filiation", "recruitment", and group composition actually exhibited by the group members--i.e. sociological descent versus biological ancestry (Barnes 1962, Langness 1964, Sahlins 1965, Watson 1964). As Sahlins points out, it is highly improbable that group membership and geneological fact are ever identical in localized populations.

> Where descent is . . . engaged in the political domain, as the charter of territorial communities and political actions, it is subject to vicissitudes unlikely to beset it in other contexts. It is compromised by residential practices. The ideals of common descent are more or less fiction, as people of different derivation are incorporated in the same group. Still, the genealogical impurities are irrelevant. This is polity, and therefore commitment, not recruitment (1965:104).

He continues:

> Certainly if the doctrine is agnatic, this must affect modes of residence and affiliation. But the composition of the descent group is subject to additional forces. Demographic and ecological circumstances, including military threat and displacement, are known to induce instability of local affiliation in numerous instances. Facts of life overcome norms of membership (1965:105).

At present, it is generally agreed that most Highland socieities emphasize agnatic connections as an ideology of descent, the cognatic Huli being a notable exception (Glasse 1959, 1968). The debate has focused on the crucial "facts of life" in the Highlands which appear to influence recruitment practices and, therefore,actual composition and solidarity of local groups. Warfare and defense, common residence, big man leadership, and competitive exchange have been discussed by many writers (Barnes 1962, 1967, Berndt 1964, Brown 1962, Cook 1970, Kaberry 1967, Glasse and Lindenbaum 1969, Langness 1964, 1968, de Lepervanche 1967-68, Lowman-Vayda 1968, Meggitt 1965, Ryan 1959, Strathern 1969a, 1972). The interplay of these numerous factors results in considerable fluctuation and alteration in the membership of groups. This characteristic of Highland social groups has been noted by most students of the area and has been described as "structural looseness" (Pouwer 1960, DuToit 1962), "flexibility" (Brown 1962), and a high degree of "optation" (Barnes 1962). While these concepts are potentially useful, Watson (1965b) and Wagner (1974) have noted that they tend to be employed when the models of ethnographers do not conform with their observations. A. Strathern (1972:216) points out that it is unlikely that such flexibility is without limits; " . . . in optative systems choice is never unrestricted" (Firth 1963:28). Without some specification of what options are available to individuals, the asserted attribute of flexibility leads to further obscurance of the nature of the social organization. Attempting to follow similar leads, Watson (1970) has proposed a model which views society as a flux of individuals and Wagner (1974) has emphasized the improvisational skills of individuals in organizing themselves.

The focus of inquiry returns to the individuals involved in these groups. Langness, moving forward from his original formulation of the problem, states it nicely:

> The problem, then, is not to resolve the discrepancy between ideology and behaviour, as I originally suggested (1964), but to try to find out more accurately what the ideology is, and how a society can feature so prominently the rights of individuals (1968:313).

The social groups in Ilakia exhibit many of the characteristics associated with Highland social organization. Patrilineal "descent" is employed as a "symbol of group unity" (Glasse and Lindenbaum 1969:378), but numerous individuals are readily incorporated into these groups who are acknowledged to lack actual biological ties through their patriline. Genealogical knowledge is limited to about five generations and only an occasional older man is able to recall selected names in the third ascending generation. Unrelated individuals from other villages who desire to become permanent residents of Ilakia or individuals who decide to change their group affiliation within Ilakia must obtain permission from the group they seek to enter. This is usually formalized by a male elder of the receiving group who presents himself as a <u>sponsor</u> of the incoming person. The sponsor acts as the "father" or "elder brother" of the new member whose social identity is extended from this relationship.

The terminology to be followed here was developed by Robbins (1970) for the neighboring Auyana and was used by Hayano (1972) for the Tauna Awa. It consists of the following levels of social units: sovereignty, pooling unit, and sub-pooling unit. To adequately describe the Ilakia Awa, one additional level must be included, the pooling unit cluster (See Figure 2). Each of these social unit categories conforms to groupings explicitly recognized by the Ilakians themselves.

According to Robbins, a sovereignty is defined as " . . . the largest social unit whose members help one another in fights with outsiders and who are taken as a legal unit by outsiders" (1970:7).

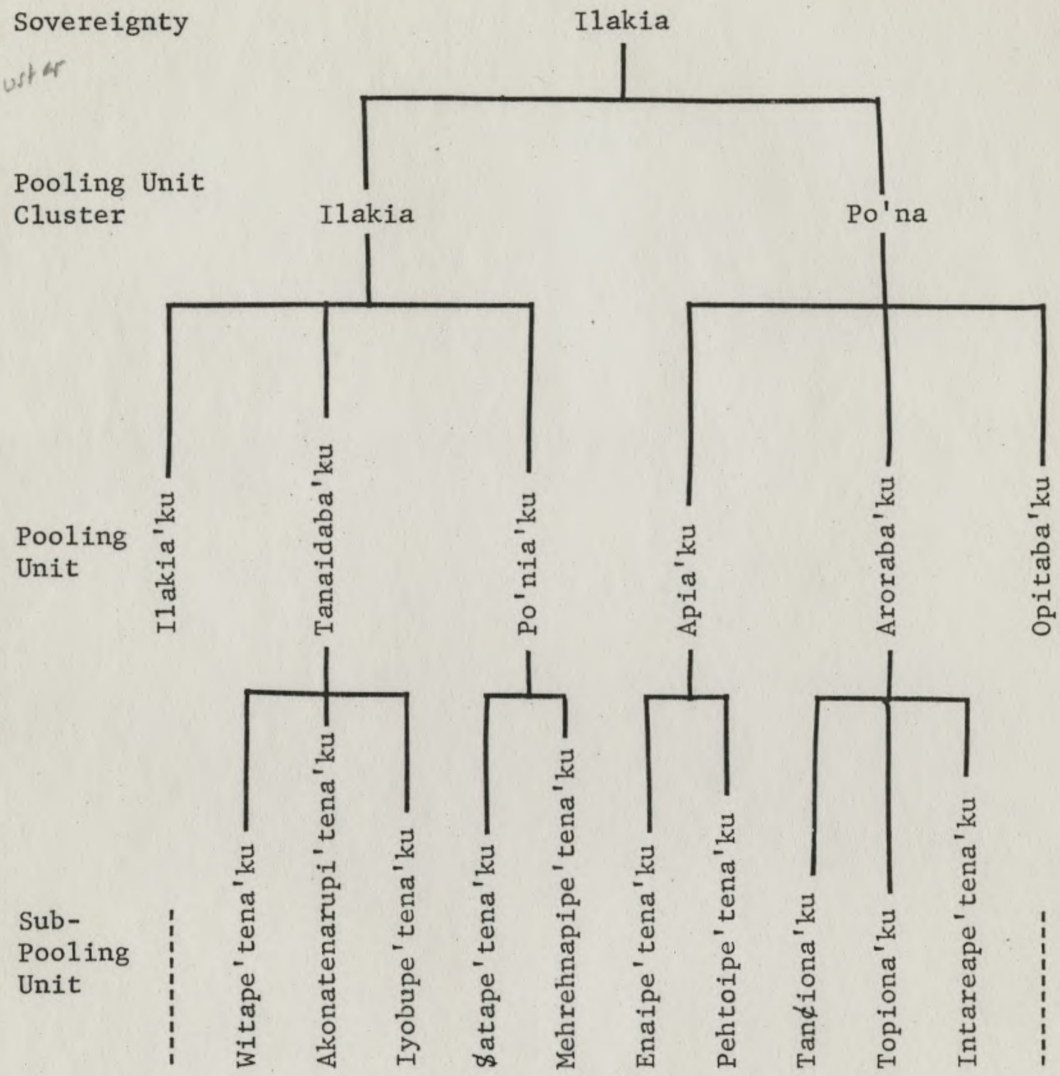
> A member of a sovereignty, or unit within the sovereignty is defined as one who has obligations and interests to act on behalf of the sovereignty and is subject to all the economic and politico-legal obligations which are implied in it (Hayano 1972:46).

Specific "obligations and interests" thought to be definitional attributes of a sovereignty are enumerated and dealt with in detail by both Robbins and Hayano. The general attributes which apply to the sovereignty of Ilakia are the following: 1) all people living in one named place with access to one unit of land; 2) not attempting to kill one another in fights; 3) sharing cooked pork in a peacemaking feast after a fight between

FIGURE 2: HIERARCHY OF SOCIAL GROUPS, ILAKIA VILLAGE.

sov cluster

sov



House-holds	2	5	10	5	5	3	10	9	7	1	0	16	= 73
Population (1 Oct. 72)													
Male	3	9	20	8	9	6	24	23	11	3	0	25	= 141
Female	5	20	8	6	9	5	12	10	13	1	2	22	= 113
Total	8	29	28	14	18	11	36	33	24	4	2	47	= 254

members; 4) not working sorcery on one another; 5) revenging the death of a member caused by another sovereignty without expecting a payment for doing so; 6) prosecuting offenses (encroachment on land or poaching of other resources, destruction or stealing of property, and physical attack or sorcery) against a member committed by a non-member; 7) holding a feast after a "successful" fight against another sovereignty; 8) making a collective payment to non-members who helped in a fight against other sovereignties; 9) not helping non-members in a fight against other members; and 10) being subject to revenge by another sovereignty when a member killed someone in that sovereignty.

For describing the internal organization of the sovereignty of Ilakia the basic concept is that of a pooling unit. Therefore, it will be discussed first.

Following the discussions of Robbins (1970) and Hayano (1972), a pooling unit has the following attributes that apply to Ilakia: 1) members refer to themselves as one group and attach the suffix /-a'ku/ to their group name; 2) fighting between members is not with intent to kill and usually involves sticks, not bows and arrows; 3) marriage between members is prohibited; 4) performing a purification ritual for a member husband to protect him from pollution following a miscarriage by his wife;

5) pooling the major portion of a payment for people outside the sovereignty who revenged the death of a member; 6) pooling the major portion of a payment to allies outside the sovereignty who participated in a fight resulting from an offense by or against a member; 7) pooling payments given to non-member relatives at certain life-crises events (pregnancy and birth, nasal septum piercing, male initiation, marriage, and death)[9] of adult male members, members' wives, and members' unmarried children; 8) receiving payments from non-member relatives at the same life-crises events of married female members and their children; 9) prosecuting offenses (abduction of female members, adultery, under-payment or non-payment of specific obligations, physical abuse, and destruction of property) committed against them by members of other pooling units, either within or outside the same sovereignty; and 10) not helping non-members in a fight against members. In Ilakia, there are six pooling units.

The six pooling units in Ilakia are grouped into two pooling unit clusters, each composed of three pooling units. While this level of social units is clearly recognized by Ilakians, its definitional attributes are much more difficult to stipulate and to distinguish from those of a sovereignty or a pooling unit. As shown by Table 1, there is a significant residential patterning

TABLE 1: HOUSEHOLD RESIDENTIAL UNIT LOCATION AND SOCIAL UNIT AFFILIATION, ILAKIA VILLAGE, 1 OCTOBER 1971.

Pooling Unit Cluster Affiliation	Hamlet Cluster of Residence: Ilakia*	Hamlet Cluster of Residence: Po'na
Ilakia	27	3
Po'na	3	40

$\chi^2 = 50.3,\ p < .001$

*Includes households residing in Pio'pe hamlet.

distinguishing the two pooling unit clusters--i.e. households affiliated with Ilakia pooling unit cluster (based on the membership of the male head whether living, deceased, or temporarily absent) tend to reside in the Ilakia hamlet cluster, and households of Po'na pooling unit cluster affiliation tend to reside in the Po'na hamlet cluster. This relationship is even more striking than suggested by Table 1 since five of the six contrary cases are widows who returned to the residential location of their own pooling unit clusters after the death of their husbands. Therefore, it can be said that members of a pooling unit cluster tend to live in one place.

Members of a pooling unit cluster do consider themselves a group, especially vis-a-vis members of the other pooling unit cluster, but the names of the pooling unit clusters, like that of the sovereignty, do not include the suffix /-a'ku/. The names of all pooling units and sub-pooling units do include this suffix. This perhaps denotes the relative paucity of events which are regarded as the exclusive concern of the pooling unit cluster. As expected, adherence to several of the sovereignty attributes--i.e. the prohibition on homicidal fighting, the mandatory revenging of a member's death in inter-group fighting, and the protection of members' property and person--are intensified at the pooling unit cluster level.

The only events I was able to discover that are considered to be solely under the control of the pooling unit cluster consisted of feasting and dancing activities. These are held several times a year between the Ilakia and Po'na pooling unit clusters. One cluster initiates the event by inviting the other group to come and dance for them. On the appointed day, the guests spend most of their time collecting special leaves, flowers, and moss from the forest and crafting them into elaborate body decorations. The hosts spend the day gathering food from their gardens, firewood from the bush, and cleaning the accumulated debris from the dance ground. About four hours after sundown, the guests assemble in their own hamlet cluster and start the singing and dancing as they move to the hamlet cluster of the hosts. On arriving at the dance ground, everyone openly admires the costumes and the singing and dancing continues nonstop. Some of the hosts may join in the activities and individual guests occasionally pause to warm themselves by the roaring fires and puff on a tobacco pipe. As the night wears on, the hosts will start the cooking of food which consists mainly of tubers since no animals are killed for such occasions. At dawn, or, more specifically, "at the third crowing of the rooster," the singing and dancing stops, costumes are discarded, and everyone eats. Within a few weeks, the event will be essentially repeated with the roles of host and guest being reversed.

Less frequently, a pooling unit cluster may enter a dance exchange relationship with another sovereignty. Such events were described as very similar to the one above with reciprocal exchanges of food and hospitality. When this event occurs between a pooling unit cluster and another sovereignty, it usually involves Po'na and the sovereignty of Tawaina, or Ilakia and the sovereignty of Abomatasa. These pooling unit clusters have numerous affinal ties with these respective sovereignties. If such events are arranged with the sovereignties of Tauna or Mobuta, Ilakia also participates as a sovereignty since both pooling unit clusters have close ties with those groups.

Pooling unit clusters may also act as a group when a serious food shortage necessitates requesting short-term aid. This may take place between the two pooling unit clusters of Ilakia, or between a single cluster and another sovereignty. An example of this relationship commenced about June 1970 when the sovereignty of Tawaina had a food shortage and asked the pooling unit cluster of Po'na for assistance. A group of men had just returned to Tawaina from working at the coast and the producing gardens were not adequate to feed them. Po'na members spent several days harvesting yams, taro, sweet potatoes, sugarcane, bananas, and a few peanuts. The raw food was placed in a large pile near the men's house in Opingkape hamlet and the Tawaina people were invited to come and receive it. Speeches were made emphasizing the lasting friendship between the two groups and the promise to repay at a later date. On 9 August 1972, the repayment was made. Members of Tawaina carried a pole to Po'na on which were tied 24 assorted tree kangaroos and wallabies which had been killed in the Tawaina forest during the preceeding 48 hours. Po'na members considered this a good repayment of their prior generosity.

Sub-pooling units are distinguishable groups within the pooling units. There are ten such units within the sovereignty of Ilakia with two pooling units having no subdivisions. The characteristics of sub-pooling units are similar to those of the pooling units. The essential difference is an intensification of the control of aggression between members and of the obligations to assist fellow members. When one of them is the subject of a ceremony or pooling activity, co-members will take the initiative in organizing the event and will contribute the major portion of goods.

The system of subsistence production of the Ilakia Awa conforms to the general type prevalent throughout the Highlands. The technique of shifting, slash-and-burn agriculture is practiced in conjunction with pig raising. The Ilakians, however, do exhibit several important divergences from most other Highland groups. First, they place a greater emphasis on the production of yams and taro than on sweet potatoes. During the 1971-72 agricultural cycle, Ilakians allocated about 40 per cent more land to yams and taro combined than to sweet potatoes. The estimated production of raw, unprocessed tubers for human consumption shows that the combined weight of yams and taro exceeded that of sweet potatoes by about 5 per cent.

Ilakians are proud of their greater reliance on yams and taro than their Fore and Auyana neighbors and say that they only eat sweet potatoes, which are really pig food, when they do not have the more desired staples. Indeed, whenever an outsider asked why a white man had come to live in Ilakia, they were invariably told it was because of the good food. Watson (1967a: 89-95) has suggested that the Awa may provide support for his hypothesis concerning the "revolution" in Highland subsistence patterns and social organization caused by the relatively recent introduction of sweet potatoes (See Watson 1965a, 1965c; cf. Brookfield and White 1968), but no direct evidence to confirm this was obtained. As far as Ilakian informants are concerned, they have always grown sweet potatoes as a secondary crop.

A second distinguishing characteristic is the widespread use of small-scale irrigation in taro gardens, a practice which is common in all Awa villages and evidently extends to the South Tairora villages up the Lamari River and to the Anga groups along the Aziana River. Bamboo pipelines are constructed which transport the water from the source to the garden site.

Third, until recently, the Ilakians lacked the enthusiastic preoccupation with pig husbandry reported for most other Highland groups. In October 1971, the total pig population of the village was 110 (0.41 pigs per person) with a total estimated live weight of 6100 kilograms (13,420 pounds).

Each of the above aspects of subsistence production in Ilakia will be treated in detail below.

Tools employed in subsistence production in Ilakia remain few and simple. Prior to the acquisition of steel implements, a stone adze, used for felling trees and clearing the undergrowth in forest gardens, and a wooden digging stick, used for loosening the soil in the forest, turning the sod in the grasslands, and planting, completed the tool inventory. These implements were manufactured and maintained with a slightly larger variety of small tools, including flint scrapers, pig and cassowary bone chisels, bamboo knives, and a fine-grained grinding stone. At present, the steel axe and bush knife have completely replaced the stone adze. Some returned migrants also have brought back from the plantations long slender pieces of steel sharpened on one edge which are used as scythes for cutting grass in the grasslands and around coffee trees. Steel spades have displaced the wooden digging stick for cutting the sod in the grassland, but the digging stick is still almost exclusively used for the planting of crops, a task for which it is very suitable. While the more efficient steel tools reduce by three to four times the amount of labor required to complete these specific subsistence tasks (See Clarke 1971: 175, Salisbury 1962b:109, Saraydar and Shimada 1971, Townsend 1969), they have not altered the cultivation techniques. In Boserup's terms, the Ilakians have basically changed to ". . . better makes of tools, but without changing the kind of tool" (1965:27).

Notes

1. G. Linsley, A/ADO, claims that the word "lamari" is a corruption of the Tairora word "namari" meaning water or watercourse (Patrol Report, Kainantu No. 6, 1951-52, p. 16).

2. W. T. Brown, P.O., took an aneroid altimeter reading of 2700'at the river crossing between Ilakia and Mobuta (Patrol Report, Kainantu No. 8, 1953-54, p. 8) and the Lamari-Puburamba confluence would be several hundred feet below this level. Pataki, however, states that the lowest land claimed by any Awa village was 3200'. (1968:35). Pataki's measurement is certainly more accurate than Brown's since it was made by "calibrated aircraft altimeter" with negligible error to 9000'", but the exact location of the reading is not given. The intermediate figure of 3000' is arbitrarily chosen as a reliable estimate.

3. This discussion of floral composition relies heavily on the work of Robbins (1963), Pataki (1968), Clarke (1971) and Hays (1974). The reader is referred to these studies for more detailed descriptions.

4. At present, cassowary are extremely rare. During 1971-72, cassowary tracks were reported by Ilakians on several occasions and one questionable sighting was claimed. Only two men still set traps for this highly prized bird and it had been several years since one had been caught.

5. Published studies of the Awa language include A. Loving and McKaughan (1964), R. Loving (1966, 1973a, 1973b), R. and A. Loving (1962), R. Loving and McKaughan (1964), McKaughan (1964, 1973a) and McKaughan and A. Loving (1973).

6. The estimates of walking time are based on an average pace when people are not weighted down with heavy loads or in a hurry to arrive. During the summer of 1970, I made one trip to Tauna, and during 1971-72, I visited Mobuta on two occasions and Tawaina, Amoraba, and Tainoraba on one occasion each. I did not go to either Agamusi or Iyona so these estimates are more approximate.

7. These areal measurements are calculated from orthogonal distances on the following aerial photomap: Frame 2125, Run 4, Lamari River, CAJ 1247, 9-7-68, SB55-10, Division of National Mapping, Canberra, Australia. The line of flight was directly over Ilakia at an altitude of 25,000 feet.

8. Following Fosberg (1962), Clarke (1971:52) uses the term "altered primary forest" to refer to forested areas where the vegetation has been subjected to small-scale human exploitation, but has never been completely cleared.

9. There is no ritual in Ilakia associated with first menstruation like that described by Hayano (1972:88-89) for the Tauna Awa. The Ilakians attribute this difference to the fact that Tauna is located closer to the Auyana people who also ritually observe this life-crisis event.

CHAPTER THREE

ALTERNATIVES AND VARIATION IN ILAKIAN SUBSISTENCE AGRICULTURE

The topic of subsistence agriculture has long occupied the attention of anthropological researchers.[1] As exemplified by the lengthy bibliographies available (See especially Conklin 1961, MacLeish *et al*. 1940, Spencer 1966), however, the study of productive systems of subsistence farmers has not been the exclusive domain of a single discipline or focused on one geographical area of the world. For the purposes of this discussion, the following definition of subsistence production is adequate:

> . . . 'subsistence production' can be used to describe a situation where the fruits of an individual or group productive effort are directed more toward meeting immediate consumption needs out of production, without any or few intermediaries or exchange (barter or monetary) (Wharton 1969:13).

A major portion of studies made of subsistence agriculture have been directed toward systems based on the impermanent cultivation of specific plots of land where the period of cropping is shorter than the duration of fallow, generically known as swidden, or shifting, cultivation (Conklin 1961:27). The descriptive accounts of societies falling within this general class of productive systems are voluminous. Several good comparative studies also have attempted to synthesize our knowledge of these local systems (See especially Allan 1965, Barrau 1958, 1961, Brookfield with Hart 1971, Clark and Haswell 1964, Nye and Greenland 1960, Spencer 1966). A wide range of attributes and variables have been suggested for these descriptive and comparative purposes, including cropped/fallowed land ratios, labor inputs/productive output ratios, soil management techniques, water control systems, organization of labor, skills and technological expertise, crop associations, etc.

Many of the recent efforts to increase our understanding of shifting agricultural systems have utilized the population pressure model of Boserup (1965). Attempts to explain the enormous variation observed between various systems are made by holding most of the above factors constant and allowing one or more of them to fluctuate against some measure of local population, usually density, which then is asserted to be the independent causal variable. While some of these studies have produced very informative correlations, based on both increasing and decreasing populations densities (See especially Allen 1971, Clarke 1966, Brookfield with Hart 1971, Netting 1969), all are subject to at least one major flaw: in order to compare a group of agricultural systems, each local system is assumed to be homogeneous with respect to its position along a continuum, or to the presence or absence of a given attribute.

The lack of validity of this assumption of local homogeneity in subsistence agricultural systems is undoubtedly apparent to most writers and is explicitly recognized by many. The lure of comparative generalizations, however, overrides the systematic treatment of observed complexity in all but a few cases (See especially Waddell and Krinks 1968, Waddell 1972). The serious implications of this fact are that the considerable array of strategic alternatives available to subsistence agriculturalists within the structure of their own systems, and the frequencies with which, and the conditions under which, these various alternatives are employed are eliminated from the analyses. This renders impossible any understanding of the basic dynamics of subsistence agricultural systems and completely glosses over the inherent flexibility of such productive systems. As Brookfield recognizes:

> More immediately productive than the semantic jungle of descriptive classification, however, is the search for meaningful ways to express the dynamics of whole agricultural systems, their interrelation and their potential for change (Brookfield with Hart 1971: 89).

Admittedly, the internal variation exhibited by subsistence agriculture systems is a major stumbling block for investigators, but it is also a necessary condition for the existence of such organizations. In order for groups of subsistence agriculturalists to persist indefinitely, their productive base must necessarily be capable of adjusting not only to shifts in local population size and density, but also to abnormal environmental impingements--e.g. drought, frost, insect and animal predation--and to unpredictable sociocultural events--e.g. warfare, obligations of intervillage alliances, initial taxation, etc. Local production systems must provide viable alternatives to member units to maintain the essential flexibility in allocating crucial resources and organizing production.

It is obviously impossible for one investigator to measure all dimensions of variability in a given subsistence agricultural system. An attempt will be made, however, to describe important options available to Ilakian subsistence cultivators. The actual choice of options available during one twelve-month agricultural cycle by a sample of household production/consumption units exhibiting variable characteristics will be analyzed. Emphasis will be placed on the size and composition of garden inventories utilized by these units, measurements which are assumed to reflect their annual subsistence agriculture strategies. While the strategies employed are highly variable, it will be shown that they do exhibit recognizable and significant regularities.

Subsistence Alternatives

The organization of subsistence agriculture in Ilakia has several built-in options which allow household production/consumption units considerable flexibility in access to, and utilization of, important resources. Available alternatives to be discussed concern types of subsistence gardens, organization of the annual subsistence cycle, access to garden land, division of labor in subsistence tasks, and auxiliary subsistence labor.

Types of Subsistence Gardens

The system of subsistence agriculture practiced in Ilakia provides a good opportunity for analyzing variability within the population. All households follow a structured seasonal sequence of cultivation activities during which most gardens of a particular type are planted and harvested at approximately the same time.

Specific exceptions will be noted below. Further, all households cultivate a relatively large number of small plots of land, often separated by considerable distances, each of which conforms with remarkable homogeneity to specific typological criteria. This facilitates the identification of each plot and, therefore, its classification within the appropriate garden type category.

The following nine garden types can be distinguished by the ecological zone of location, clearing and soil preparation techniques, presence or absence of irrigation, and association of principal crops (See Table 2 for summarized information).

<u>Forest Yam-Taro</u> (/to/) --- This type of garden is usually made in the secondary forest regrowth on ground that has been fallow for 10 to 20 or more years. Occasionally new plots are opened on land not known to have been previously cultivated. Such gardens are the only type that serve to convert altered primary forest into secondary forest regrowth. The slashing of vegetative cover begins in late August or early September. By mid-September, burning and fencing activities are being carried out. Planting, using a digging stick to loosen the soil, commences the end of September and everyone has finished planting by early November. Those households that make more than one Forest Yam-Taro garden usually

TABLE 2: GARDEN TYPES AND CHARACTERISTICS, ILAKIA VILLAGE.

English Name / Awa Name	Zone of Location			Clearing Technique		Preparation of Soil		Irrigation		Season of Preparation and Planting	Principle Crops	No. of Times Planted	Length of Time from Clearing to Next Phase or Fallow	Length of Fallow
	grassland	secondary forest	altered primary forest	slash-and-burn	slash only	tilled and roots removed	not tilled	yes	no					
Forest Yam-Taro /to/		X	X	X			X		X	Sept.-Nov.	yams, taro banana, greens, corn, beans, sugarcane	1	2 yrs.	10-20+ yrs.
Grassland Yam-Taro /ongi/	X			X		X			X	Mar.-July	yams, taro, banana, greens, sugarcane	1	1½ yrs.	5-10+ yrs.
Tilled Grassland Sweet Potato /o'maka/	X			---	---	X			X	Nov.-Feb. July-Aug.	sweet potato, manioc	1-6	1-3 yrs.	5-10+ yrs.
Peanut /karipe ongi/	X			---	---	X			X	Nov.-Feb.	peanuts	1	½ yr.	5-10+ yrs.
Forest Sweet Potato /topangkago/		X		X			X		X	Mar.-Aug. Nov.-Dec.	sweet potato	2-5	1-3 yrs.	10-20+ yrs.
Untilled Grassland Sweet Potato /topangkago/	X			X			X		X	Jan.-Feb. Aug.-Sept.	sweet potato	1-2	1-2 yrs.	5-10+ yrs.
Irrigated Grassland Taro /mehko/	X			X		X		X		Nov.-Feb.	taro, "pitpit", banana, sugarcane	1	2 yrs.	5-15+ yrs.
Irrigated Forest Taro /ubi/		X					X	X		Nov.-Feb.	taro, banana, sugarcane	1	2 yrs.	10-20+ yrs.
Sugarcane /ta'kigau/		X		X			X		X	Nov.-Feb.	sugarcane	1	2 yrs.	10-20+ yrs.

have cleared and planted the plot most distant from the village by the first of October and then repeat the process on a second plot. The planting sequence is as follows: first, yams and taro; second, sugarcane, bananas, and the vegetatively reproduced greens (7 of the 9 named varieties); third, crops for which seeds are planted--e.g. wing beans, maize, and green beans--plus those recently introduced crops that are propagated by vine and stem cuttings or transplanting--e.g. squash, tomato, cucumber, cabbage, and green onions; fourth, and finally, tobacco and two varieties of greens are planted by broadcasting the seed. The number of named varieties of common crops that can be planted in gardens located in the forest zone is given in Table 3. The whole planting operation is completed in a few days, so the above sequence evidently is important for the spatial organization of the garden, not for the timing of specific crop harvests. Each Forest Yam-Taro garden is planted only once and is left fallow after the harvest of the sugarcane and bananas.

Grassland Yam-Taro (/ongi/) --- Clearing activities for this grassland garden commence in late February. Grass along the proposed perimeter of the garden is cut to provide some degree of fire control and the entire plot is then burned over. By mid-March, fencing is

TABLE 3: ECOLOGICAL ZONE OF PLANTING FOR VARIETIES OF COMMON FOOD CROPS, ILAKIA VILLAGE.

Crop Name	No. of Varieties Planted in Forest Only	No. of Varieties Planted in Grassland Only	No. of Varieties Planted in Both Forest and Grassland	Total Number of Varieties
Yam:				
Dioscorea alata	5	38	0	43
D. bulbifera	0	0	6	6
D. pentaphylla	0	0	2	2
D. esculenta	0	1	0	1
D. nummularia	0	1	0	1
Taro:				
Colocasia esculenta	0	0	31	31
Xanthosoma sp.	0	0	1	1
Sweet Potato:				
Ipomoea batatas	0	0	16	16
Manioc:				
Manihot utilissima	0	0	1	1
Sugarcane:				
Saccharum officinarum	0	0	26	26
Banana:				
Musa spp.	3	0	7	10
Wing Bean:				
Psophocarpus tetragonolobus	0	0	8	8
Greens:				
(including *Brassica juncea*, *Hibicus manihot*, *Rungia klossii*)	4	0	5	9

completed for those gardens within range of foraging pigs and tilling of the ground is already under way. Women turn the soil with steel spades to a depth of ten to twelve inches, crumble the larger clods of earth, and remove the numerous grass roots. According to Clarke and Street (1967:11), the tilling of grass-fallowed soil results in ". . . improved aeration that may (a) increase nitrification and (b) relieve toxic conditions characteristic of such soils." It is a painstaking and laborious task which continues on a regular basis until mid-July. Three varieties of yams--i.e. two _Dioscorea alata_ and the and the only _D. nummularia_--are usually planted before the entire garden area is tilled. When the tilling is completed, the rest of the _D. alata_ varieties are planted followed by the _D. bulbifera_, _D. esculenta_, and _D. pentaphylla_ varieties and five types of greens. When the yam shoots appear above ground, the taro is planted. As much as three months may elapse between the planting of the first yams and the last taro. Occasionally, small amounts of various recent vegetable crops, mostly squash, maize, watermelon, cucumbers, and tomatoes, are included along the edges of these gardens. After the appearance of the first dry leaves on the yam vines, sugarcane and bananas are planted to complete the crop assemblage. If specific Grassland Yam-Taro gardens produce very large yams and taro, they will be left after only one harvest and recultivated following a minimum fallow period of four to five years. If, however, the production is not extraordinary, these plots enter a second phase of cultivation, called /o'maka/ or Tilled Grassland Sweet Potato garden.

Tilled Grassland Sweet Potato (/o'maka/) --- This garden is made only as the second phase of the Grassland Yam-Taro garden--i.e. after the yams and taro have been harvested. Sweet potato and a few manioc stem cuttings are planted and sugarcane and bananas remain from the earlier phase. Some of the recently introduced vegetables also may remain or be replanted. The first planting of this garden may occur in July or August immediately after the yam-taro harvest, but more frequently is delayed until November or December after completion of the Forest Yam-Taro gardens. The soil is retilled after the first harvest of sweet potatoes and again after each second succeeding harvest. A maximum of six croppings may be taken before the plot is left fallow for a period of 5 to 10 or more years.

Peanut (/karipe ongi/) --- Peanuts were obtained by the Awa within the last decade and enjoy great popularity among the Ilakians.[2] Peanut gardens are usually planted between November and February on the same plots of ground used for the Tilled Grassland Sweet Potato gardens. They may be planted after the Grassland Yam-Taro garden phase and before the first planting of the Tilled Grassland Sweet Potato garden on that specific plot of land or they may be interjected between successive croppings of the Tilled Grassland Sweet Potato plots. Peanut gardens contain only peanuts and are considered a temporary utilization of the site. No garden sites are ever newly cleared and tilled specifically for peanuts. Also, after harvesting the peanuts, these plots are always replanted as Tilled Grassland Sweet Potato gardens.

Forest Sweet Potato (/topangkago/) --- This type of garden is located in the secondary forest regrowth, usually in relatively close proximity to the village. Preparation of this garden proceeds at a leisurely pace, compared with the intensive periods of labor inputs for the Forest Yam-Taro and Grassland Yam-Taro gardens, with clearing and fencing activities lasting several months. While women are involved during March to July tilling the soil for the Grassland Yam-Taro gardens, men clear and fence the new Forest Sweet Potato plots. Burning of the accumulated debris usually occurs during August prior, to the beginning of the rains and preparation of the new Forest Yam-Taro gardens. Planting of the sweet potato vine cuttings and a few manioc stem cuttings, the only crops included in this type of garden, characteristically takes place in November or December after completion of the Forest Yam-Taro gardens. Replanting previously harvested plots of this garden type also is usually done during this period each year. However, households which depend heavily on Forest Sweet Potato garden--e.g. households with many pigs--may replant sections of the garden during other times of the year. The soil is loosened with a digging stick around each planted stem, but no general tillage is performed. These plots are normally left to fallow for 10 to 20 or more years after two to five croppings when tuber size is said to diminish, or when the fence is deteriorated and requires extensive rebuilding.

Untilled Grassland Sweet Potato (/topangkago/) --- This type of garden is very similar to the Forest Sweet Potato garden, as is evidenced by the fact that the Ilakians do not make a terminological distinction between the two. Both utilize the same crop association and planting technique and can conceivably be considered subtypes of the /topangkago/ category. However, for the descriptive typology being employed here, their differing ecological zones of location make it necessary to treat them as separate types. It must be emphasized that although the same term is applied to both the forest and grassland varieties, Ilakians are fully cognizant of the important differences. As will be shown later, they appear to utilize these two types in response to very different situations. When it is necessary to verbally differentiate these two types, with respect to a particular plot, the ground name specifying the location of the garden is given. Since the entire territory belonging to Ilakia is subject to a comprehensive system of place names, in which all plots of ground, ranging in size from a fraction of a hectare to about three hectares, have specific names, the use of a place name accurately indicates the ecological zone of location. The important distinguishing characteristics of these two garden types are several. The clearing of the Untilled Grassland Sweet Potato gardens requires only the cutting and burning of grass, not the slashing of secondary growth. Further, such gardens are always placed out of the range of foraging pigs so that fencing is not required. This means that the labor inputs for this type of garden are comparatively low and the tasks required may be performed by either men or women. Since these gardens produce edible tubers approximately five months after planting, they are often added to the inventories of households during January to February or July to August to cover anticipated food shortages in August or January, respectively. Such shortages occasionally occur during these interim periods between the harvests of the Forest Yam-Taro and the Grassland Yam-Taro gardens. These plots may be replanted, but often they are left to fallow with significant amounts of tubers still in the ground.

Irrigated Grassland Taro (/mehko/) --- This garden is cleared and the soil is turned and crumbled, in the same manner as the Grassland Yam-Taro garden, during November to February. Planting of the principal crops--i.e. taro, two kinds of "pitpit" (*Saccharum edule* and *Setaria palmifolia*), bananas, and sugarcane--occurs in late February. Bamboo pipelines, constructed by fitting lengths of bamboo end-to-end and lashing them with vines to sapling poles, snake their way across the landscape bringing water to the garden site from springs located up to one-half mile away. These plots are not replanted and return to fallow after harvesting the bananas and sugarcane.

Irrigated Forest Taro (/ubi/) --- This type of garden is located in the secondary growth or gallery forest along small streams whose water source is tapped and transported through bamboo pipelines to the garden site. The area is slashed clean with the debris removed to the edges of the plot forming part of the fencing barrier. No burnoffs are carried out in these gardens.

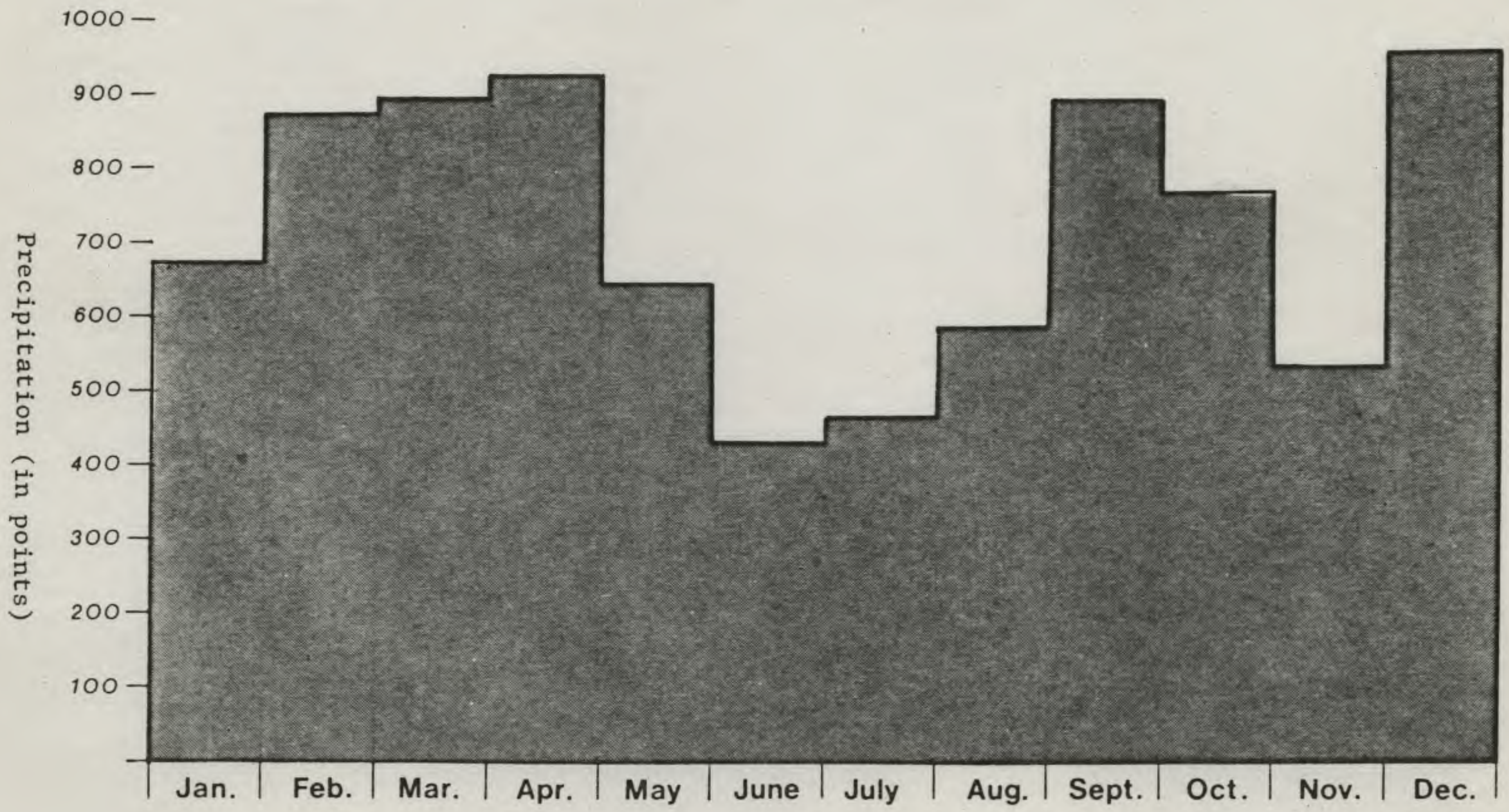
Informants attributed this to the fact that such gardens are always small in size, and, therefore, it requires less labor to remove the cleared refuse than to pile and burn it. Preparation and planting occurs from November to March and the only crops included are taro, bananas and sugarcane. The plots are planted only once and then allowed to revert to bush.

Sugarcane (/tah'kigau/) --- This garden is located in the secondary regrowth usually in close proximity to the village. Clearing, fencing, and planting take place between November and February with only sugarcane and occasionally some tobacco being included. This garden is considered a supplement to the sugarcane production from other garden types and after one harvest is left fallow.

Organization of Annual Subsistence Cycle

As in most tropical regions, the occurrence of annual seasons in Ilakia is largely determined by one major climatic variable, rainfall. According to monthly precipitation measurements recorded at Okapa for 1959 through 1963 (Brookfield and Hart 1966), rainfall exhibits a trimodal distribution with peaks occurring in April, September, and December and troughs in January, June, and November (See Figure 3). While the major seasons of the year are distinguished by Ilakians on the

FIGURE 3 : MEAN MONTHLY PRECIPITATION, OKAPA, EASTERN HIGHLANDS DISTRICT, 1959-1963.



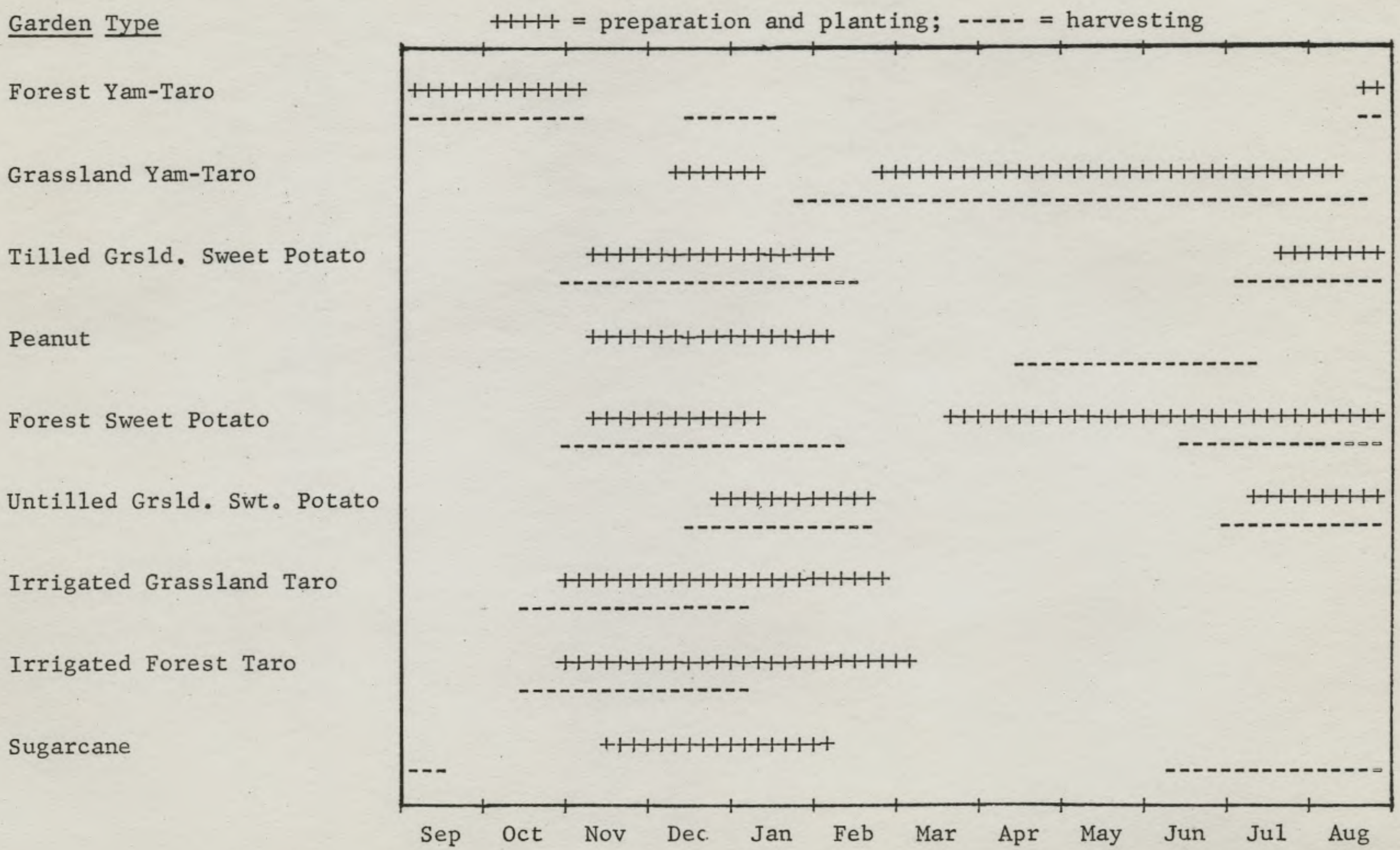
Source: Brookfield and Hart (1966, Appendix ii, Table 1).

basis of the location of the rising sun on the eastern horizon, it is the expectation or actual occurrence of precipitation that strongly influences the scheduling of subsistence activities. While it is undoubtedly true that the planting of gardens would never be held up indefinitely due to the failure of anticipated precipitation, it is also true that minor temporal adjustments are made in the timing of garden planting to conform with slight year-to-year fluctuations in the onset of the rainy season. That is to say, specific agricultural activities do not commence on fixed calendrical dates, so the following designation of agricultural seasons, based on observations conducted during one twelve-month period, are only approximate. A comparison of the temporal sequence of major preparation, planting, and harvesting activities by garden type is given in Figure 4.

The annual subsistence agricultural cycle in Ilakia is divided into four major periods or seasons: the Forest Yam-Taro period, the "wet" season, the Grassland Yam-Taro period, and the "dry" season. While the "wet" season does not correspond to the time of greatest precipitation, it is the only term used to designate the interim period between finishing the Forest Yam-Taro gardens and beginning the new Grassland Yam-Taro gardens.

The annual cycle commences in late August with

FIGURE 4: ANNUAL SEQUENCE OF MAJOR SUBSISTENCE AGRICULTURE ACTIVITIES BY GARDEN TYPE, ILAKIA VILLAGE.



clearing of land for the new Forest Yam-Taro gardens. Since all household production units make at least one such garden, gardening activities are relatively uniform during this period. The clearing and burning of plots is timed to terminate just as the frequency and amount of rainfall begins to increase. If the rains start earlier than expected or an individual is slow in clearing the new garden, the effort required to complete the burn-off will be greatly increased. When the ground is soft and moist from the initial rains, the planting of the new garden begins. The planting of a new Forest Yam-Taro garden requires the harvesting of a mature garden of the same type to obtain taro setts and yam sections for vegetatively propagating the new crop. This also makes available an abundant supply of the much desired yams and taro for food. The array of crops in the new gardens is usually planted, and the tubers from the mature gardens are usually consumed, by the first of November.

During the "wet" season, which lasts from the beginning of November to the middle of February, there is considerable variation among households as to the types of gardens prepared and harvested. Some households continue working in the forest zone planting new Forest Sweet Potato gardens or clearing and planting Irrigated Forest Taro gardens and Sugarcane gardens. Other households shift to the grassland zone and spend their time on Irrigated Grassland Taro, Tilled Grassland Sweet Potato, and Peanut gardens. Agricultural activities are less intensive during this period than in the prior season, so people spend more time in the village working on craft items and go more often to visit and trade in other villages. Food is also less abundant during this season. By late December, taro from mature irrigated gardens is nearly finished. Also, much of the sweet potato crop is inedible because the tubers sprout and become mushy due to the dampness of the soil. Traditionally, the period from the end of December to the end of January represented a time of extreme food shortage, but this has been partially relieved by integrating maize and green beans into the cycle so that their harvest occurs at this time. During January, then, Ilakians subsist mainly on small amounts of inferior taro and sweet potatoes, bananas, and wing beans plus the maize and green beans. A tuber harvest study, conducted from 6-19 January 1972 and based on the weight of raw, unpeeled tubers for human consumption harvested daily for fourteen days by five selected households, showed the average harvest to be 1.4 kilograms (3.0 pounds) per day per adult male consumer unit. This is compared to a similar study carried out for the same households from 26 July to 8 August 1972, when food is not considered to be in short supply, which yielded 2.4 kilograms (5.3 pounds) per day per adult male consumer unit. The lack of quality food becomes a major topic of conversation during the lean period and some individuals with cash may go to the stores in Okasa or Okapa to purchase rice and tinned fish.

Late February through June is the season of the Grassland Yam-Taro gardens. Members of all household units are intensively engaged in clearing, burning, and tilling the sod of the grasslands. While the women work preparing the grassland soil, men clear and fence the new Forest Sweet Potato plots. During this season, plenty of the most desired yams, as well as taro, from the mature Grassland Yam-Taro gardens, are available for human consumption.

From July to early September, rains fall infrequently and the sun is brutal. Ilakian households again show wide variation in gardening activities and the work regime is less intensive than during the preceeding period. Some households still have a little planting to finish in their Grassland Yam-Taro gardens and men preparing Forest Sweet Potato plots continue their efforts sporadically. Others work in Tilled Grassland Sweet Potato and Untilled Grassland Sweet Potato gardens. Sustenance is obtained largely from sweet potatoes during this season and the consumption of sugarcane, cucumbers, and watermelon increases to relieve the parching effects of the hot sun. Low water levels in the rivers and streams also make fishing and hunting more productive. Men often spend several days away from the village tending eel traps and fishing with hook-and-line. Small groups of women also occasionally spend a day at the river to seine for small fish and crustacea with woven bark-string dip nets.

The annual subsistence agricultural cycle in Ilakia, then, is characterized by two seasons--the Forest Yam-Taro and the Grassland Yam-Taro periods--of relatively uniform gardening activities. During the remainder of the year, however, considerable variation is possible in terms of the types of gardens prepared. This gives each household production/consumption unit the flexibility it requires to plan a garden inventory capable of fulfilling its subsistence needs.

Access to Garden Land

According to Ilakian informants, a shortage of agricultural land has never been a problem for this village. With the greater freedom of movement gradually resulting from the cessation of intervillage warfare, several areas some distance from the village, which were never before cultivated during the memory of living people, have been opened to gardens. Nonetheless, it is recognized that there exists a finite number of desirable sites for specific garden types which are known to be consistently productive. This characteristic of certain locations is usually attributed to the richness of the soil and to the ease with which the various crop spirits, especially the yam and taro spirits, can be enticed to remain in the area throughout the growing cycle. While there was no evidence of keen competition for valued sites, Ilakians do have a complex hierarchy of rules governing access to agricultural lands. Based mainly on pooling unit membership criteria, it is further complicated by ties of adoption, fosterage, and friendship, as well as normal population fluctuations within these groups.

Access to land is based on permanent or usufruct rights. Permanent rights are acquired through membership in a pooling unit, established either by birthright or by sponsorship, and remain in force until death, loss of membership in the pooling unit, or, in the case of women, marriage. Male offspring of a given man, however, can exercise primary permanent rights over all plots of land gardened by their father. This means that no one, including other members of the same pooling unit or sub-pooling unit, can use these plots without their permission. By the same token, all males have primary permanent rights over all plots of land they themselves have gardened which are located on ground belonging to their pooling unit. An individual male, then, establishes primary permanent rights for himself and his male offspring on all plots of land he utilizes which belong to his pooling unit. These are the only plots of land said to be "owned" by individuals and anyone else wishing to use such land must obtain specific permission from the owners. Secondary permanent rights to land are held by all male members of a pooling unit in all ground belonging to that pooling unit which is not subject to primary rights by other individuals or sibling groups within that pooling unit.

Usufruct rights to garden land are acquired by seeking and receiving permission from individuals or groups holding permanent rights. Such permission is temporary, usually being limited to one complete cycle of the garden, and neither the gardener nor descendants of the gardener have any subsequent claim to the plot of ground. Young married women often obtain usufruct rights to garden land belonging to their natal pooling unit and it is not uncommon for older widows to do the same. A man occasionally invites a close friend from a different pooling unit to make a neighboring or contiguous garden on his land. Table 4 presents data on the rights to access exercised by a sample of 36 Ilakian households (to be

TABLE 4: ACCESS RIGHTS TO PRODUCING GARDENS OF THIRTY-SIX HOUSEHOLDS, ILAKIA VILLAGE, OCTOBER 1971 THROUGH SEPTEMBER 1972.

Garden Type	Permanent				Usufruct			
	Number of Plots	Percentage of Plots	Area Occupied (in hectares)	Percentage of Area Occupied	Number of Plots	Percentage of Plots	Area Occupied (in hectares)	Percentage of Area Occupied
Forest Yam-Taro	40	63.5	1.7382	66.5	23	36.5	0.8754	33.5
Grassland Yam-Taro	28	53.8	0.8223	60.7	24	46.2	0.5317	39.3
Tilled Grassland Sweet Potato	42	63.6	0.9206	72.4	24	36.4	0.3506	27.6
Peanut	16	70.0	0.2873	77.8	7	30.0	0.0818	22.2
Forest Sweet Potato	23	85.2	1.3105	87.7	4	14.8	0.1623	12.3
Untilled Grassland Sweet Potato	4	66.7	0.0928	63.9	2	33.3	0.0524	36.1
Irrigated Grassland Taro	13	61.9	0.3805	58.4	8	38.1	0.1789	41.6
Irrigated Forest Taro	5	100.0	0.0505	100.0	0			
Sugarcane	0				1	100.0	0.0155	100.0
TOTAL	171	64.8	5.6027	71.4	93	35.2	2.2486	28.6

discussed below) to garden the land under cultivation in 1971-1972. The data show that gardens located on land obtained on the basis of temporary usufruct rights represent 35 per cent (93 of 264) of the plots and occupy 28.6 per cent (2.2486 of 7.8513 hectares) of the total area cultivated by the sample households.

Division of Labor in Subsistence Tasks

Although subsistence tasks performed exclusively by one sex are not numerous, the distinctions that are observed are very important. First, the clearing of land in the grassland and in the forest is carried out jointly by both males and females. The task of pollarding large trees however, is done only by men. The reason given for this is that women never climb trees; if they were to do so, their elevated vaginas would contaminate a large area of garden land and would be exposed to anyone on the ground.[3] While this restriction is of no importance for the grassland gardens, it precludes the preparation of forest gardens without some input of labor by men.

Second, fence-building is a task done only by men. This involves butting long lengths of bamboo end-to-end and stacking them horizontally one on top of another between pairs of vertical sapling stakes which are sharpened on one end and repeatedly jabbed into the earth until they reach a depth of 6-10 inches. When the bamboo is stacked between the planted stakes to a height of about three feet, each pair of supporting stakes is tied together by vines or strips of bark to secure the bamboo. Depending on the strength desired for the fence, the distance separating each pair of stakes varies from one-and-one-half to five feet. Occasionally, wooden planks are split off the trunks of felled trees and used instead of bamboo for the horizontal portion of a fence. While women often contribute the major portion of labor involved in cutting the bamboo and transporting the building materials, the cutting of wooden planks, procurement of materials for tying the fence (which usually necessitates climbing trees), and actual construction of the fence are done exclusively by men. In terms of labor requirements for garden preparations, this task restriction means that all gardens in the areas frequented by foraging domestic and feral pigs--i.e. all gardens in close proximity to the village and most gardens in the forest--require male labor inputs.

Third, the construction of bamboo water pipelines for the irrigated gardens is considered the exclusive responsibility of men. Once again, women usually carry the bulk of the materials to the site, but only men are involved in the actual construction.

The sole subsistence task delegated exclusively to women is the turning of the sod and the removal of roots for the tilled grassland gardens. Men may assist in the cutting and burning of the grass, but the laborious task of preparing the soil is accomplished only by female labor. Since households lacking productive adult females are very rare in Ilakia,[4] the impact of this task restriction on subsistence agriculture is slight.

Auxiliary Subsistence Labor

Ilakian households may exercise several means of gaining subsistence labor assistance from individuals who are not members of their specific household units. Such assistance may involve individuals or groups and may be given on the basis of reciprocal exchange, direct compensation, or free donation.

Informal reciprocal labor exchange between two or three close friends or relatives occurs frequently during the annual subsistence cycle. Especially during periods of intensive labor inputs, when the working day is extended, individuals may exchange labor on nearly a daily basis working alternate days in the gardens of each person involved. While there may be small gains in productivity, especially for the tasks of fence-building and bamboo pipeline construction, the reasons given for such reciprocal exchanges all concern the enjoyment and well-being of the gardeners. It is said that having someone to talk to while working is good because it relieves the boredom of solitary labor. Also, it is thought that lone individuals anywhere--i.e. in the bush, gardens or village--are much more vulnerable to attack by sorcerers and evil spirits than people in small groups. Such attacks can result in serious injury, illness, or occasionally death.

While it is not rare for men to exchange labor in this fashion, it is much more common among pairs or small groups of women. Lone women on the trails or in the gardens are thought to be inviting (and possibly willing) targets of personal assault. A woman who is observed in such circumstances is considered to have suspicious motives and may be subjected to open ridicule. Therefore, if the garden area is not easily observable by other gardeners or if the husband or other close male kinsman is not working in a garden in the immediate vicinity, women will cooperate and exchange labor on a regular basis.

The free donation of labor by an individual occurs only between adult males and matrifocal households. As was discussed above, the organization of the annual subsistence cycle in Ilakia demands that all household production/consumption units have at least one forest garden, the Forest Yam-Taro garden. The sexual division of labor, which allocates inter alia the pollarding of trees and the building of fences exclusively to men, makes it necessary for all matrifocal households to obtain the assistance of an adult male during at least one period of the year. Such help is invariably sought within the exogamous group of the female and is donated with no claim to compensation in goods, services, or resulting crops. The women in such relationships are said to occasionally give their benefactors small gifts of raw food or portions of special dishes when available, or to back their positions in village decision-making and dispute settlements. However, they are under no formal obligations to do either.

Households who are involved in regular labor exchange or donation relationships often locate their gardens of the same type on contiguous plots of land. All necessary preparations of the land up to the point of planting--e.g. clearing, burning, fencing, tilling, and irrigating--are carried out by the combined labor forces of participant households. Just prior to planting, however, small strips of bamboo and, in some instances, rows of decorative plants, are used to partition the total garden area into distinct plots belonging to each of the cooperating households. All subsequent tasks--e.g. planting, weeding, setting support poles for sugarcane and climbing yams, and harvesting--are the sole responsbility of the individual owners. Such contiguous gardening is frequently utilized by patrifocal households who agree to assist one or more matrifocal households. Not only does this facilitate the desired companionship while working, but also, by enclosing several plots within a single fence and, where appropriate, supplying water by the same bamboo pipeline, the overall amount of male labor required is significantly reduced.

Auxiliary subsistence labor by groups occurs only on special occasions. The group of individuals comes together to perform a specific task of known labor requirements and, except for those situations noted below, always receives direct compensation for the assistance. Such group efforts may be proposed by anyone who can afford the payment obligations involved. Since compensation is given in the form of raw garden produce, the individual requesting assistance must have a sizable surplus of mature garden areas which can be harvested. Further, it is said that the size of the tubers given as payment must be respectable. As one informant stated, "If the garden is good and the yams grow large, a man can ask others to help him make a new garden. But if the yams are small, he eats them himself and makes his own garden." While it is at least theoretically possible for any household to meet these requirements, the 17 households recorded as sponsors of 22 group garden labor events (10 observed, 12 elicited verbally) from October 1971 through September 1972, were all patrifocal. The sponsoring household may request assistance from members of the same pooling unit, from affines, or from both of these groups, or may offer the opportunity to some other limited group of individuals. Of the 17 sponsors, three said they invited their "children", seven said their affines, two said both pooling unit co-members and affines, four said "women", and one said the young initiated, unmarried men.

This form of group gardening assistance usually involves the two types of yam-taro gardens, and, less frequently, the Forest Sweet Potato gardens. During 1971-72, various tasks in eleven Forest Yam-Taro, nine Grassland Yam-Taro, and two Forest Sweet Potato gardens were carried out by group labor.

Since the volunteers usually work only one day and never more than two days, the tasks they undertake depend not only on the type of garden involved, but also on the amount of work already carried out by the owner.

In Forest Yam-Taro gardens, male laborers are usually requested to assist with tree-cutting and fence building activities. In such situations, the female laborers assist with clearing underbrush and transporting bamboo for the fence. If, however, the owner has completed these tasks prior to enlisting the aid of the group, the men busy themselves with a final clearing of debris and some last minute burning while the women laborers accompany the sponsor to his mature garden. Forest Yam-Taro gardens mature in ten to twelve months after planting and must be at least partially harvested within a short period of time to provide the vegetative cuttings used to plant the new Forest Yam-Taro plots. The female volunteers, under the direction of the owner, harvest the mature garden and transport the edible tubers to a convenient location to await later distribution to the workers. The taro setts that are cut off the mature tubers and the yam sections selected to propagate the new crop are taken by the woman to the new garden site. If the new plot is ready to be planted, both men and women help complete this task. When the job is done, all participants are given generous amounts of raw yam and taro tubers, harvested from the mature garden, plus bananas, sugarcane, greens, and, occasionally, a few sweet potatoes from other producing gardens of the sponsor.

For group labor in Grassland Yam-Taro gardens, the major task involved is the tilling of the soil. Since this task is only performed by women, the sponsor only requests female workers. When the tilling is finished, or the second day of labor is nearing an end, the sponsor takes the group of workers to his mature Grassland Yam-Taro garden to harvest the yams and taro. As in the case of Forest Yam-Taro gardens, the cuttings are taken to the new plot and planted, if time permits. When the group work activities are completed, yams, taro, bananas, sugarcane, and greens are given to the workers as immediate and final compensation.

Occasionally, a group labor request is made for helping with Forest Sweet Potato gardens. Usually the major tasks involved are clearing the fence row and building the fence. The owner of the plot completes the clearing and planting at a later time. The division of tasks is the same in this instance as for the other gardens. The male laborers clear the fence row and construct the fence while the women transport the bamboo fencing material. The difference in group labor for Forest Sweet Potato gardens is that compensation to the volunteer workers is deferred. While an earthoven is usually prepared by the sponsor to feed the laborers after their work is completed, the major payment is not made until the garden they helped prepare is mature. Five to six months after the labor contribution, the sponsor calls the group together at the garden site and allows each person to harvest thirty to forty pounds of sweet potatoes.

If an untimely illness or injury occurs during a crucial period of garden preparation or planting which renders a household incapable of carrying out its normal subsistence activities, the unfortunate household may appeal to the village as a whole for assistance. On such occasions a group of twenty to thirty individuals will voluntarily contribute, without immediate compensation, the one or two days of labor required to complete the preparation and planting of a specific garden. Individuals who participate in this type of cooperative venture pragmatically explain that if they did not help the temporarily infirm household, they would be called on to provide its members with food at some later point in the year. In the words of one informant, "It is better to help them grow their own yams than to have them sit and watch me eating mine." To repay these labor contributions, the household which received assistance will wait until the garden is mature and will then prepare a large earth-oven of foodstuffs from the garden and distribute it among those individuals who helped make the garden.

The local ward councillor also may ask for, and be given, group assistance during intensive periods of garden preparation and planting. As discussed in Chapter One, Ward 40 encompasses the Awa villages of Tauna, Tawaina and Ilakia who jointly elect their councillor for a two-year term and rotate the position among the three villages for consecutive terms. Thus, an Ilakian man serves in this capacity for two of each six years. During his period of tenure, the councillor represents the villages of his ward on the Local Government Council (LGC) for the Okapa Subdistrict. His duties require attendance at monthly meetings of the LGC in Okapa. With travel time, this trip necessitates a two- to three-day absence from the village. Other duties of the councillor include the adjudication of serious disturbances within any of the three villages which local participants are not able to resolve on their own, the settlement of all inter-village disputes involving any of the three villages, and the reporting of any violence or bloodshed to the authorities in Okapa. Needless to say, the responsibilities of a councillor are often complex, the demands on his time considerable, and the requests for his services unpredictable. When his duties as a public official make it difficult for him to meet his responsibilities as a head of household, the councillor can legitimately request assistance from other persons in his village. Such aid is most likely to be needed during the periods of intensive garden preparations when the necessity of intensive subsistence labor is the greatest. This type of labor assistance comes under the rubric of "government work" and the recruitment of the work force is different than for other group labor activities. Instead of relying on kinspersons and close friends, the call for help to make gardens for the councillor is responded to by several volunteers from each of the six pooling units. Like other kinds of "government work"--e.g. the clearing of trails, the building and repairing of government rest houses, etc.--the persons who help with the councillor's gardens will receive no compensation for their labors. Therefore, the work load is expected to be borne equally by the major social groups.

Household Production/Consumption Units Sample

The original intent of this study was to measure the garden plots utilized by all Ilakian households for two twelve-month agricultural cycles which would facilitate an analysis of year-to-year fluctuations within given households. This proved to be infeasible for two reasons. First, a verbal garden census, elicited from the seventy-three heads of household, listed approximately 750 individual plots either planted or producing during one twelve-month period. This meant that the proposed project would have involved detailed measurements of about 1500 gardens, a number far exceeding my initial estimate. A task of such magnitude would have required more time than was available. Second, the proposed plan was vetoed by the village because newly planted gardens, especially the Grassland Yam-Taro plots, are thought to be very susceptible to damage by "foreign" spirits. The activiites and instruments required to make the areal measurements were the subject of open suspicion and thought to be the possible source of agricultural disaster. After several sessions of negotiating with village members, I agreed not to enter or photograph any newly planted gardens without the permission and presence of the owner. In turn, I was given blanket permission to measure and map any gardens which were close to maturity or being harvested. These constraints of time and access required that the garden measurement activities be systematically limited.

To reduce the number of plots to a manageable magnitude, the decision was made to utilize a fifty per cent sample of households. Since the research project was concerned with the impact of post-contact cultural alternatives, especially labor migration, on subsistence activities, and since it was assumed that the household labor force strongly influences its subsistence strategy, the village household sample was stratified into three groups: 1) patrifocal households, the male head of which had never been a migrant agreement worker ("patrifocal-non-migrant"); 2) patrifocal households, the male head of which had completed at least one two-year contract as a migrant agreement worker ("patrifocal-migrant"); and 3) matrifocal households--i.e. households headed by females, including those with unmarried adult males (over fifteen years of age) in residence. A fifty per cent random sample without replacement was then taken from each group by drawing names from a hat. This resulted in a total sample of eleven of 23 patrifocal-non-migrant, fourteen of 28 patrifocal-migrant, and eleven of 22 matrifocal households.

To comply with the wishes of the Ilakians, the decision was made to include in the sample only those gardens which were planted from November 1970 through October 1971--i.e. those gardens which would be harvested between November 1971 and October 1972. Since these gardens were designed to feed the village population that actually existed during the research, this time period was quite acceptable for the objectives of the study. Garden measurement activities, employing two assistants, commenced on 27 April 1972 with the grassland gardens that had been harvested since October 1971, and moved on in July 1972 to bush gardens that would be harvested in September and October 1972. Measurements on 327 individual garden plots and 91 coffee gardens plus 6 additional plots used for a planting density study were completed by the first week of October 1972.[5]

Although the total number of garden plots measured for households in the sample group was 327, the decision to limit the subsistence analysis to gardens which were designed to provide foodstuffs for the twelve-month period from November 1971 through October 1972 demanded that several types of gardens actually measured be eliminated from the sample. Therefore, the garden data included in the discussion below is subject to the following limitations and exclusions:

1) Old Forest Yam-Taro gardens which were harvested of all tubers during late 1971 are excluded from the sample. These gardens do continue to produce bananas and sugarcane during the period of analysis, but do not produce any tubers, and they require only a negligible labor input. Their inclusion here would unduly inflate the areal measurements of concern to this analysis by approximately doubling the quantity of this garden type for each household--i.e. the area utilized for this garden type during twenty-four months instead of the stipulated twelve-month period.

2) Forest Sweet Potato gardens which were planted, but not producing tubers, before August 1972 were excluded. When a given household had two of these gardens

producing during the twelve-month period, one was nearing abandonment and the other was only recently being brought into production. In such cases, these gardens were assumed to overlap during the research period and one-half the area of each plot was excluded.

3) Tilled and Untilled Grassland Sweet Potato gardens which were not producing tubers before August 1972 were totally excluded if the household concerned had other gardens of this type which were producing during the research period. If, however, the household had no other gardens of this type producing by August 1972, only one-half the area of a nearly mature, but as yet unharvested, garden was excluded from the analysis. The assumption here is that gardens harvested and left fallow during the early months of the research period--i.e. late 1971--were overlooked during the period of actual measurement activities. Therefore, the total elimination of all nearly mature plots would disregard the normal overlapping production of these gardens and, thereby, introduce an unacceptable bias.

4) Small plots of sweet potatoes are occasionally planted in the grasslands and left untended. About five such plots were fortuitously encountered during the measurement activities and none were ever included in verbally elicited household garden inventories. These

marginal gardens require a very low labor input and are said to be harvested only on the rare occasion of a crop failure in other gardens. Since these plots are very small in size, few in number, unsystematically sampled, and not considered to be "real" gardens by the Ilakians, they are excluded from the analysis.

5) Gardens ruined by predators--e.g. feral and domestic pigs, rodents, marsupials, and insects--are not excluded from the analysis. Since the ruined plots were originally part of the annual production strategy of the households, their exclusion would cause an erroneous assessment of the garden inventories. However, if new gardens were made to replace those that were destroyed, only the areas of the new plots are included.

After elimination of these measured plots, a total of 264 gardens are left to be included in the analysis presented later in this chapter.

The thirty-six household production/consumption units in the sample are described on the basis of characteristics which allow comparison of various aspects of both the labor force and the consumption requirements of each unit. The following nine variables are used: <u>focality</u>, <u>age class of household head</u>, <u>household size</u>, <u>adjusted number of human consumer units</u>, <u>adjusted number of total consumer units</u>, <u>adjusted number of producer</u>

units, _human dependency ratio_, _total dependency ratio_, and _participation in agreement labor migration_.

Focality refers to the sex of the resident head of household; if male, the household is classifed as patrifocal (P); if female, as matrifocal (M).

Age class of household head is an attempt to approximate age of heads of household within five year intervals. Since Ilakians do not use calendrical dates, the actual age of individuals is not known. The estimates made here result from relating the occurrence of age-specific events in an individual's life--e.g. birth, initiation, marriage, first child, etc.--to events of known dates--e.g. introduction of maize, Japanese plane crash, first government patrol, specific subsequent patrols, etc.--and from establishing relative ages based on co-members of initiation and marriage groups, approximate age of oldest child, etc. In an attempt to further reduce the magnitude of error, my estimates were compared with independent estimates made by P. L. Newman in 1964-65. In most cases where differences occur, an average of the two estimates is used. The age class designations are as follows:

Class Number	Inclusive Ages
1	20-24 yrs.
2	25-29
3	30-34
4	35-39
5	40-44
6	45-49
7	50-54
8	55-59
9	60+

Household size is simply the total number of individuals who regularly pool their labor in subsistence tasks and who rely on jointly prepared garden plots for the major portion of their sustenance. Of the 25 patrifocal households in the sample, 23 are nuclear families (20 with one or more children and 3 without children), one is extended by the elderly, nonproductive mother of the wife, and one is polygynous having two wives. Of the 11 matrifocal households, 9 are composed of only one woman (7 are widows, 1 is divorced, and 1 is the wife of an agreement labor migrant) and two are widows with one or more children.

The adjusted number of human consumer units is derived by summing the consumer factors for all members of the household. These consumer factors are assigned to each individual on the basis of the proportion of an average adult male's normal consumption assumed to be representative of the individual's age class and sex. The magnitude of the factors is based on weighed samples plus observed eating habits and informants' statements. Certainly individual variation is masked by this procedure and by the gross age categories employed, but the resulting figures compare favorably with those obtained by Hipsley and Kirk (1965) and Rappaport (1968:282). The following scale of consumer factors is used:

	Male	Female
birth through 4 yrs.	0.3	0.3
5 yrs. through 14 yrs.	0.5	0.5
15 yrs. to elderly	1.0	0.8
elderly (inactive)	0.5	0.5

The adjusted number of total consumer units includes pigs being fed from the gardens of (but not necessarily owned by) the household unit as consumers in the given household. Although Ilakians keep only small numbers of pigs and feed them relatively small amounts of food (Boyd 1974), some assessment of the impact of pigs-as-consumers on the subsistence production strategies of Ilakian households is necessary. Based on observed feeding practices and informants' statements, the following pig consumer factors, derived as the proportion of an average adult human male's normal consumption calculated as representative of the pig's weight class, are used:

less than 12 kilograms	0.1

12-50 kilograms	0.3
more than 50 kilograms	0.5

The _adjusted number of pig consumer units_ for a given household is the sum of the pig consumer factors for all pigs supported by the household. The _adjusted number of total consumer units_ for a given household is the sum of the adjusted number of human consumer units and the adjusted number of pig consumer units for the household.

The _adjusted number of producer units_ is similarly derived by summing the producer factors of all members of the household. The producer factors are assigned to each individual on the basis of the proportion of an average same-sex adult's labor contribution assumed to be representative of the individual's age class. The magnitude of the factors is based on observed participation in subsistence gardening activities and informants' statements. The following scale of producer factors is used:

	Male or Female
birth through 10 yrs.	0.0
11 yrs. through 14 yrs.	0.3
15 yrs. to married	0.5
married to elderly	1.0
elderly (nonproductive)	0.0

(NOTE: In matrifocal households, males in the 15 yrs. to married age category are counted as 1.0 producer units.)

The human dependency ratio is simply the adjusted number of human consumer units per adjusted number of producer units. This index allows a comparison to be made between households as to the production burden assumed by the workers of each household. As the number of human consumers for whom each producer must work increases, the human dependency ratio also increases.[6]

The total dependency ratio is the adjusted number of total consumer units per adjusted number of producer units. This effectively includes pigs as part of the production burden assumed by workers in each household.

Participation in agreement labor migration by patrifocal households is categorized as follows: if the household head has completed at least one two-year contract as an agreement labor migrant, his household is designated "patrifocal-migrant"; if the household head has never participated in the agreement labor program, the unit is considered as "patrifocal-non-migrant."

The descriptive data for each of the 36 households in the sample based on the above nine variables are enumerated and summarized in Table 5.

Subsistence Garden Inventories of Ilakian Households

To describe the subsistence agriculture strategies employed by the Ilakian households included in the sample, the measured areas (in hectares) of the nine garden types

TABLE 5: CHARACTERISTICS OF HOUSEHOLD PRODUCTION/CONSUMPTION UNITS SAMPLE, ILAKIA VILLAGE, 1 OCTOBER 1971.

Household Identification Number	Focality	Age Class of Household Head	Household Population: Male: birth through 4 yrs.	Male: 5 yrs. through 10 yrs.	Male: 11 yrs. through 14 yrs.	Male: 15 yrs. to married	Male: married to elderly	Male: elderly	Female: birth through 4 yrs.	Female: 5 yrs. through 10 yrs.	Female: 11 yrs. through 14 yrs.	Female: 15 yrs. to married	Female: married to elderly	Female: elderly	Household Size	Adjusted Number of Human Consumer Units	Adjusted Number of Total Consumer Units	Adjusted Number of Producer Units	Human Dependency Ratio	Total Dependency Ratio	Participation in Agreement Labor Migration
Patrifocal-Migrant Households:																					
ØP08A	P	7					1				1		1		3	2.3	2.4	2.3	1.00	1.04	X
TA06A	P	6			1		1			1			1		4	2.8	3.6	2.3	1.22	1.57	X
KU05A	P	5	1	1	1		1				1		1		6	3.6	4.6	2.6	1.38	1.77	X
NA01A	P	5		3		1	1						1		6	4.3	4.4	2.5	1.72	1.76	X
PØ02A	P	4		1			1		1		1		1		5	3.1	4.6	2.3	1.35	2.00	X
KU01A	P	4	1				1			1			1		4	2.6	2.6	2.0	1.30	1.30	X
TA03B	P	4	1				1						1		3	2.1	3.8	2.0	1.05	1.90	X
ØP04A	P	3					1			1			1		3	2.3	3.0	2.0	1.15	1.50	X
NØ07A	P	3					1			1			1		3	2.3	4.3	2.0	1.15	2.15	X
KU02B	P	3					1						1		2	1.8	3.9	2.0	0.90	1.95	X
NØ11A	P	2					1		1				1		3	2.1	2.3	2.0	1.05	1.15	X
ØP13B	P	2					1						1		2	1.8	2.4	2.0	0.90	1.20	X
TA08A	P	2					1						1		2	1.8	2.1	2.0	0.90	1.05	X
ØP23A	P	2					1						1		2	1.8	3.5	2.0	0.90	1.75	X
Totals for Patrifocal-Migrant Households:																					
	-	-	3	5	2	1	14	0	2	4	3	0	14	0	48	34.7	47.5	30.0	--	--	-
Means for Patrifocal-Migrant Households (n=14):																					
	-	3.7	-	-	-	-	-	-	-	-	-	-	-	-	3.4	2.48	3.39	2.14	1.16	1.58	-
Patrifocal-Non-Migrant Households:																					
ØP01A	P	8					1		1	1			1		4	2.6	2.6	2.0	1.30	1.30	-
NØ05A	P	8				1	1						1		3	2.8	3.8	2.5	1.12	1.52	-
ØP15A	P	7			1	1		1					1		4	2.8	4.0	2.3	1.22	1.74	-
NØ08A	P	7					1			1		1	1		4	3.1	3.6	2.5	1.24	1.44	-

TABLE 5 (continued):

NA06A	P	6		1		1	1			1			1		5	3.8	3.8	2.5	1.52	1.52	-
TA02A	P	6	1		1		1			1		1	1		6	3.6	5.5	2.8	1.29	1.96	-
PI05A*	P	6					1		2	2			2		7	4.2	5.2	3.0	1.40	1.73	-
ØP14A	P	6			1		1			1			1		4	2.8	3.4	2.3	1.22	1.48	-
ØP02A	P	6			1		1			1			1		4	2.8	4.9	2.3	1.22	2.13	-
ØP22A	P	5		2	1		1		1				1	1	7	4.1	6.4	2.3	1.78	2.78	-
ØP09A	P	5	1	2	1		1						1		6	3.6	4.2	2.3	1.57	1.83	-
Totals for Patrifocal-Non-Migrant Households:																					
	-	-	2	5	6	3	10	1	4	8	0	2	12	1	54	36.2	47.4	26.8	--	--	-
Means for Patrifocal-Non-Migrant Households (n=11):																					
	-	6.3	-	-	-	-	-	-	-	-	-	-	-	-	4.9	3.29	4.31	2.44	1.35	1.77	-
Totals for All Patrifocal Households:																					
	-	-	5	10	8	4	24	1	6	12	3	2	26	1	102	70.9	94.9	56.8	--	--	-
Means for All Patrifocal Households (n=25):																					
	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-	4.1	2.84	3.80	2.27	1.25	1.66	-
Matrifocal Households:																					
ØP10A	M	9											1		1	0.8	0.8	1.0	0.80	0.80	-
NØ04A	M	8											1		1	0.8	1.4	1.0	0.80	1.40	-
PI01A	M	8											1		1	0.8	1.4	1.0	0.80	1.40	-
NØ12A	M	7											1		1	0.8	1.4	1.0	0.80	1.40	-
ØP10B	M	7											1		1	0.8	0.8	1.0	0.80	0.80	-
PI02A	M	7											1		1	0.8	0.8	1.0	0.80	0.80	-
KU04A	M	7											1		1	0.8	0.8	1.0	0.80	0.80	-
ØP08B	M	6				1							1		2	1.8	1.8	2.0	0.90	0.90	-
ØP17B	M	6											1		1	0.8	1.3	1.0	0.80	1.30	-
PØ03B	M	5		2		1							1		4	2.8	2.8	2.0	1.40	1.40	-
ØP02B	M	1											1		1	0.8	1.9	1.0	0.80	1.90	-
Totals for Matrifocal Households:																					
	-	-	0	2	0	2	0	0	0	0	0	0	11	0	15	11.8	15.2	13.0	--	--	-
Means for Matrifocal Households (n=11):																					
	-	6.5	-	-	-	-	-	-	-	-	-	-	-	-	1.4	1.07	1.38	1.18	0.91	1.17	-
SAMPLE TOTALS:																					
	-	-	5	12	8	6	24	1	6	12	3	2	37	1	117	82.7	110.1	69.8	--	--	-
SAMPLE MEANS (N=36):																					
	-	5.4	-	-	-	-	-	-	-	-	-	-	-	-	3.2	2.30	3.06	1.94	1.18	1.51	-

*Polygynous household

are used. It is important to note that the term strategy, as it is used here, does not refer to verbal statements of intent by Ilakian gardeners, but rather to their actual behavior. The concern is with observable behavioral strategies organized and executed by the household production consumption units, not with statements about what the participant gardeners think they might or should do at some indeterminant point in the future. The elucidation of behavioral strategies in subsistence agricultural production, then, is based on the composition of each household's garden inventory which presumably was designed to fulfill their subsistence requirements for one twelve-month period. The majority of the garden plots were planted between 1 November 1970 and 1 October 1971 and harvested and consumed between 1 November 1971 and 1 October 1972. These data for each of the 36 households in the sample are presented in Table 6.

The garden inventory data for the total sample provide some important information concerning subsistence production in Ilakia. The total number of plots cultivated by the sample in 1971-72 was 264 which yields an average of 7.3 plots per household (standard deviation, s = 1.9). When asked why each household prepares such a relatively large number of plots, which are often scattered over a large area, informants responded that

TABLE 6: HOUSEHOLD GARDEN INVENTORIES, ILAKIA VILLAGE, OCTOBER 1971 THROUGH SEPTEMBER 1972

	1 FOREST YAM-TARO			2 GRASSLAND YAM-TARO			3 TILLED GRSLD. SWEET POTATO			4 PEANUT			5 FOREST SWEET POTATO			6 UNTILLED GRSLD. SWEET POTATO			7 IRRIGATED GRASSLAND TARO			8 IRRIGATED FOREST TARO			9 SUGARCANE			10 HOUSEHOLD TOTALS		
HOUSEHOLD IDENTIFICATION	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	# of plots	hectares	% of garden inventory	TOTAL NO. OF PLOTS	TOTAL AREA (in hectares)	TOTAL PERCENT OF HOUSEHOLD INVENTORY
Patrifocal Migrant Households:																														
ØP08A	2	.0642	28.3	1	.0468	21.5	3	.0553	24.3	1	.0101	4.4	1	.0488	21.5	0			0			0			0			8	.2272	100.0
TA06A	2	.1057	45.2	1	.0399	17.0	2	.0482	20.7	1	.0245	10.5	0			0			1	.0151	6.4	0			0			7	.2334	99.8
KU05A	2	.0534	29.6	1	.0399	22.1	1	.0131	7.2	1	.0229	12.7	0			0			1	.0510	28.2	0			0			6	.1803	99.8
NA01A	2	.1290	46.1	1	.0303	10.8	1	.0153	5.4	0			1	.0782	28.0	0			1	.0266	9.5	0			0			6	.2794	99.8
PØ02A	1	.0890	22.5	2	.0544	13.8	3	.0763	19.2	0			1	.1241	31.4	0			1	.0363	9.2	0			1	.0155	3.9	9	.3956	100.0
KU01A	2	.0520	26.5	1	.0356	18.2	2	.0179	9.1	1	.0140	7.2	1	.0511	26.1	0			1	.0165	8.4	1	.0084	4.2	0			9	.1955	99.7
TA03B	2	.1263	43.9	1	.0390	13.5	3	.1140	39.6	0			0			2	.0087	3.0	0			0			0			8	.2880	100.0
ØP04A	2	.0521	37.8	1	.0302	21.9	0			0			1	.0555	40.3	0			0			0			0			4	.1378	100.0
NØ07A	3	.0802	25.3	1	.0388	12.2	1	.0320	10.1	1	.0157	4.9	2	.1157	36.5	0			1	.0215	6.8	1	.0129	4.0	0			10	.3168	99.8
KU02B	2	.1409	47.4	2	.0394	13.3	1	.0090	3.0	0			1	.1080	36.3	0			0			0			0			6	.2973	100.0
NØ11A	3	.0761	36.6	2	.0293	14.1	1	.0099	4.8	1	.0094	4.5	2	.0830	40.0	0			0			0			0			9	.2077	100.0
ØP13B	1	.0582	30.5	1	.0630	33.0	0			1	.0122	6.3	1	.0577	30.2	0			0			0			0			4	.1911	100.0
TA08A	2	.1148	70.7	1	.0337	20.8	1	.0139	8.5	0			0			0			0			0			0			4	.1624	100.0
ØP23A	3	.1004	54.7	3	.0449	24.4	1	.0382	20.8	0			0			0			0			0			0			7	.1835	99.9

TABLE 6 (continued):

	1			2			3			4			5			6			7			8			9			10		
Totals for Patrifocal Migrant Households:																														
	29	1.2423		19	.5672		20	.4431		7	.1088		11	.7221		2	.0087		6	.1670		2	.0213		1	.0155		97	3.2960	
Means for Patrifocal Migrant Households (n = 14):																														
	2.1	.0887	38.9	1.3	.0403	18.3	1.4	.0316	12.3	0.5	.0078	3.6	0.7	.0393	20.7	0.1	.0006	0.2	0.4	.0119	4.9	0.1	.0015	0.6	0.1	.0011	0.4	6.9	.2354	99.9
Patrifocal Non-Migrant Households:																														
ØP01A	2	.0691	31.1	2	.0295	13.3	2	.0378	17.1	0			1	.0240	10.8	0			2	.0612	27.6	0			0			9	.2216	99.9
NØ05A	1	.0500	21.3	3	.0715	30.5	1	.0112	4.8	2	.0129	5.5	1	.0460	19.6	0			2	.0429	18.3	0			0			10	.2345	100.0
ØP15A	2	.0852	33.4	1	.0332	13.0	2	.0182	7.1	1	.0205	8.0	2	.0681	26.7	0			1	.0296	11.6	0			0			9	.2548	99.8
NØ08A	2	.1193	47.3	1	.0138	5.5	3	.0326	12.9	1	.0193	7.7	1	.0342	13.6	1	.0330	13.0	0			0			0			9	.2522	100.0
NA06A	1	.0394	18.9	1	.0168	8.1	2	.0410	19.7	1	.0056	2.7	1	.0877	42.1	0			1	.0179	8.6	0			0			7	.2084	100.1
TA02A	1	.0665	20.4	2	.0411	12.6	2	.0623	19.1	0			1	.1046	32.1	1	.0415	12.7	0			1	.0103	3.1	0			8	.3263	100.0
PI05A	2	.0670	22.0	2	.0658	21.6	4	.1080	35.5	0			0			1	.0426	13.9	1	.0209	6.9	0			0			10	.3043	99.9
ØP14A	2	.1240	38.7	1	.0337	10.5	4	.0664	20.7	2	.0341	10.6	2	.0626	19.5	0			0			0			0			11	.3208	100.0
ØP02A	2	.0835	31.2	2	.0558	20.9	2	.0427	16.0	0			1	.0559	20.9	0			1	.0219	8.2	1	.0075	2.8	0			9	.2373	100.0
ØP22A	2	.0705	23.7	1	.0276	9.3	2	.0258	8.7	1	.0203	6.8	2	.0942	31.7	0			1	.0477	16.0	1	.0114	3.8	0			10	.2975	100.0
ØP09A	2	.1254	35.8	1	.0340	9.7	1	.0092	2.6	1	.0445	12.7	1	.0863	24.7	0			1	.0505	14.4	0			0			7	.3499	99.9
Totals for Patrifocal Non-Migrant Households:																														
	19	.8999		17	.4228		25	.4552		9	.1572		13	.6636		3	.1171		10	.2926		3	.0292		0			99	3.0376	
Means For Patrifocal Non-Migrant Households (n = 11):																														
	1.7	.0818	29.4	1.5	.0384	14.1	2.3	.0413	14.9	0.8	.0142	4.9	1.2	.0603	22.0	0.3	.0106	3.6	0.9	.0266	10.1	0.3	.0026	0.9	0			9.0	.2761	99.9
Totals For All Patrifocal Households:																														
	48	2.1422		36	.9900		45	.8983		16	.2660		24	1.3857		5	.1258		16	.4596		5	.0505		1	.0155		196	6.3336	

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TABLE 6 (continued):

	1	2	3	4	5	6	7	8	9	10
Means For All Patrifocal Households (n = 25):										
	1.9 .0857 34.8	1.4 .0396 16.5	1.8 .0359 13.5	0.6 .0106 4.2	1.0 .0554 21.3	0.2 .0050 1.7	0.6 .0184 7.2	0.2 .0020 0.7	.04 .0006 0.2	7.8 .2533 100.1
Matrifocal Households:										
ØP10A	2 .0567 47.9	2 .0373 31.5	2 .0243 20.5	0	0	0	0	0	0	6 .1183 99.9
NØ04A	1 .0366 19.4	3 .0754 39.9	1 .0387 20.5	0	0	1 .0194 10.3	1 .0188 10.0	0	0	7 .1889 100.1
PI01A	1 .0174 10.9	1 .0295 18.5	2 .0318 19.9	1 .0174 10.9	2 .0633 39.7	0	0	0	0	7 .1594 99.9
NØ12A	1 .0255 23.9	2 .0372 34.9	2 .0307 28.8	1 .0131 12.3	0	0	0	0	0	6 .1065 99.9
ØP10B	1 .0292 48.5	1 .0070 11.6	2 .0239 39.7	0	0	0	0	0	0	4 .0601 99.8
PI02A	1 .0214 23.1	1 .0154 16.6	2 .0322 34.7	0	1 .0238 25.6	0	0	0	0	5 .0928 100.0
KU04A	1 .0207 18.4	1 .0206 18.3	3 .0512 45.6	1 .0011 1.0	0	0	1 .0188 16.7	0	0	7 .1124 100.0
ØP08B	2 .1055 41.3	1 .0509 19.9	3 .0906 35.4	1 .0084 3.3	0	0	0	0	0	7 .2554 99.9
ØP17B	1 .0416 27.3	1 .0266 17.5	3 .0373 24.5	1 .0326 21.5	0	0	1 .0138 9.1	0	0	7 .1519 99.9
PØ03B	2 .0771 51.5	1 .0205 13.7	1 .0122 8.1	1 .0210 14.0	0	0	1 .0190 12.7	0	0	6 .1498 100.0
ØP02B	2 .0397 32.5	2 .0436 35.7	0	1 .0095 7.8	0	0	1 .0294 24.1	0	0	6 .1222 100.1
Totals For Matrifocal Households:										
	15 .4714	16 .3640	21 .3729	7 .1031	3 .0871	1 .0194	5 .0998	0	0	68 1.5177
Means For Matrifocal Households (n = 11):										
	1.4 .0428 31.3	1.5 .0330 23.5	1.9 .0339 25.2	0.6 .0093 6.4	0.3 .0079 5.9	0.1 .0017 0.9	0.5 .0090 6.6	0	0	6.2 .1380 99.8
SAMPLE TOTALS:										
	63 2.6136	52 1.3540	66 1.2712	23 .3691	27 1.4728	6 .1452	21 .5594	5 .0505	1 .0155	264 7.8513
SAMPLE MEANS (n = 36):										
	1.8 .0726 33.7	1.4 .0376 18.6	1.8 .0353 17.1	0.6 .0102 4.8	0.8 .0409 16.6	0.2 .0040 1.5	0.6 .0155 7.0	0.1 .0014 0.5	0.1 .0004 0.1	7.3 .2181 99.8

if a person plants all his crops in one place and the ground is poor or the predation from insect and animals is heavy, he will be hungry; however, if he plants many gardens in different places, he will always have food. The total area cultivated by the sample was 7.851 hectares which averages 0.218 hectares/household (s = 0.081) and 0.0671 hectares/person.

In terms of the utilization of garden types, over 90 per cent of the households include Forest Yam-Taro, Grassland Yam-Taro, and Tilled Grassland Sweet Potato gardens in their annual inventories with 100 per cent of the households planting the two former types. These three gardens together account for 66.7 per cent of the total area under cultivation and comprise 68.6 per cent of the total number of plots. These are the only garden types that average more than one plot per household. Such empirical data confirm informants' statements to the effect that Forest and Grassland Yam-Taro gardens are the most important sources of the most desired foods and that no one could live in Ilakia without making at least these two gardens. The next most frequently used garden types are the Forest Sweet Potato, Peanut, and Irrigated Grassland Taro gardens which are planted by 58, 58, and 53 per cent, respectively, of the sample households. Together they account for 26.9 per cent of all garden plots and occupy

30.6 per cent of the cultivated land. Finally, the Untilled Grassland Sweet Potato and Irrigated Forest Taro gardens are each used by 14 per cent of the households. Together they are allotted less than 4 per cent of the plots and comprise about 2.5 per cent of gardened land. Only one Sugarcane garden is present in the entire sample.

Such summary information certainly suggests that the latter three garden types are relatively unimportant in Ilakian subsistence production. While this is undoubtedly true in terms of frequency of utilization and area of land involved for the village as a whole, the real importance of these gardens is the increased flexibility they afford individual households in organizing subsistence strategies that are compatible with specialized production requirements and labor availability. More will be said about this when discussing specific strategies below.

Table 7 compares the average size of individual plots for each garden type against all other garden types. Notwithstanding the exceptions noted below, each garden type tends to have an average size significantly different from other types. The approximate rank order, from largest to smallest, is Forest Sweet Potato, Forest Yam-Taro, Irrigated Grassland Taro, Grassland Yam-Taro, Untilled Grassland Sweet Potato, Tilled Grassland Sweet Potato, Peanut, and Irrigated Forest Taro. The sample includes

TABLE 7: COMPARISON OF AVERAGE PLOT SIZE OF GARDEN TYPES, ILAKIA VILLAGE.*

Garden Type ($\bar{x}$, s, n)	1	2	3	4	5	6	7	8
1. Forest Yam-Taro ($\bar{x}$=.041, s=.0188, n=63)	t-value df sig.							
2. Grassland Yam-Taro ($\bar{x}$=.026, s=.0135, n=52)	4.9 11.3 <.001							
3. Tilled Grassland Sweet Potato ($\bar{x}$=.019, s=.0135, n=66)	7.5 127 <.001	2.7 116 <.005						
4. Peanut ($\bar{x}$=.016, s=.0098, n=23)	7.9 ~78 <.001	3.5 ~57 <.001	n.s.					
5. Forest Sweet Potato ($\bar{x}$=.055, s=.0288, n=27)	2.3 ~38 <.025	4.9 ~34 <.001	6.1 ~30 <.001	6.5 ~35 <.001				
6. Untilled Grassland Sweet Potato ($\bar{x}$=.024, s=.0184, n=6)	1.99 ~6 <.05	n.s.	n.s.	n.s.	3.7 ~6 <.01			
7. Irrigated Grassland Taro ($\bar{x}$=.027, s=.0122, n=21)	3.9 ~34 <.001	n.s.	2.5 ~39 <.01	3.2 ~42 <.001	8.1 ~44 <.001	n.s.		
8. Irrigated Forest Taro ($\bar{x}$=.010, s=.0023, n=5)	11.8 ~64 <.001	7.2 ~39 <.001	4.4 ~34 <.001	2.5 ~26 <.01	18.7 ~31 <.001	11.8 ~21 <.001	5.7 ~25 <.001	

* one-tailed t-test;[6] not significant if p>.05

only one Sugarcane garden so computation of the statistic in this case is not possible. Two comparisons which do not show significant differences in average size are the Grassland Yam-Taro/Irrigated Grassland Taro and the Tilled Grassland Sweet Potato/Peanut. The latter result is expected since these two garden types are always made on the same plots of land. Also, four of the seven comparisons with Untilled Grassland Sweet Potato gardens exhibit no significant differences largely due to the fact that this garden type has a very high standard deviation.

By treating the entire sample as a homogeneous group, the differences in garden inventories that most likely occur are completely masked. To expose some of the variation that does exist, data on two strata of the sample, patrifocal and matrifocal households, will be explored.

First, patrifocal households average 7.8 gardens per household whereas matrifocal households average just 6.2 ($t = 3.2$, $d \approx 34$, $p < .01$).[7] Also, patrifocal households, on the average, have about twice as much land under cultivation as do matrifocal units ($t = 5.4$, $df \approx 24$, $p < .001$). This, of course, is not surprising since the census figures for the sample (See Table 5) show that the mean number of individuals per household and the mean adjusted number of total consumer units per household for patrifocal households are more than twice the magnitude of the same figures for matrifocal households. The mean adjusted number of producer units is also considerably larger. These relationships between household size, number of consumers, and number of producers on the one hand, and the garden areas cultivated and tuber outputs obtained by each household on the other, will be discussed in detail below. For the moment, simply noting that patrifocal households tend to make more gardens and cultivate more land than matrifocal households is sufficient.

Second, in terms of the percentage of households in each subsample that includes at least one plot of a given garden type in their inventories, only Forest Sweet Potato and Irrigated Grassland Taro show significant differences. More than four times as many patrifocal as matrifocal households (76 versus 18.2 per cent, respectively) make at least one Forest Sweet Potato garden ($Z = 3.2$, $p < .001$).[8] Sixty percent of patrifocal households, compared with 45.5 per cent matrifocal households, included an Irrigated Grassland Taro garden ($Z = 2.23$, $p < .02$). A higher percentage of patrifocal than matrifocal households (32 versus 9.1 percent, respectively) include Untilled Grassland Sweet Potato gardens, and a higher percentage of matrifocal than patrifocal households (63.6

versus 44 percent, respectively) include Peanut gardens, but neither of these differences is statistically significant. As noted above, all households make at least one Forest Yam-Taro and Grassland Yam-Taro garden, and all but three households (two patrifocal, one matrifocal) make at least one Tilled Grassland Sweet Potato garden. Data for the Irrigated Forest Taro and Sugarcane gardens confirm informants' statements that these types are made only by men.

Third, the average size of individual plots for each garden type exhibit significant differences between the two subsamples only for Forest Sweet Potato and Forest Yam-Taro gardens. The descriptive statistics of the former for patrifocal and matrifocal households are $\bar{x}_1 = .0577$, $s_1 = .0286$, $n_1 = 24$ and $\bar{x}_2 = .0290$, $s_2 = .0084$, $n_2 = 3$, respectively, which yields a comparative statistic $t = 3.4$, $df \approx 12$, $p < .01$. For the latter garden type, $\bar{x}_1 = .0446$, $s_1 = .0192$, $n_1 = 48$ and $\bar{x}_2 = .0314$, $s_2 = .0133$, $n_2 = 15$, respectively, with $t = 2.9$, $df \approx 32$, $p < .01$.

The above consideration of garden inventories shows that there are significant differences between patrifocal and matrifocal households in the selection of available alternatives. In general, patrifocal units make more gardens of greater average size and utilize more types of gardens in greater frequencies than do matrifocal units.

Comparison of the patrifocal and matrifocal groups in terms of the estimated tuber production of their gardens also shows some improtant differences. The estimated tuber output of each plot of a given garden type is computed by multiplying the area of each plot by the appropriate tuber output factor given in Table 8 (See Appendix for a discussion of the methods and data used to derive these factors).[9] Table 9 compares the average tuber production for the patrifocal and matrifocal households.

The group averages demonstrate that the patrifocal households produce, on the average, almost twice the amount of tubers produced by matrifocal households. If corrected for the respective numbers of consumers, however, the patrifocal group produces only about 74 per cent as much per human consumer and 71 per cent as much per total consumer as the matrifocal group. When the average output per household is corrected for the average subsistence burdens assumed by households in each group, the patrifocal units exceed the matrifocal by 42 per cent for the human dependency ratio and 38 per cent for the total dependency ratio. Perhaps most interesting is the fact that tuber output per producer and tuber output per

TABLE 8: TUBER PRODUCTION OUTPUT FACTORS, ILAKIA VILLAGE.

Garden Type	Output Factor
Forest Yam-Taro	4,492 kg./ha.
Grassland Yam-Taro	16,950
Tilled Grassland Sweet Potato + Peanut	8,540
Forest Sweet Potato	17,080
Untilled Grassland Sweet Potato	11,444
Irrigated Grassland Taro	13,411
Irrigated Forest Taro	15,000

TABLE 9: AVERAGE TUBER PRODUCTION FOR PATRIFOCAL AND MATRIFOCAL HOUSEHOLD PRODUCTION/ CONSUMPTION UNITS, ILAKIA VILLAGE, OCTOBER 1971 THROUGH SEPTEMBER 1972.

Average Tuber Output per Household:

Patrifocal - 2732.2 kg. (68,304 kg. tubers/25 households)

Matrifocal - 1398.3 kg. (15,381 kg. tubers/11 households)

Average Percentage of Total Tuber Output per Household from Each of Seven Garden Types:

	Patrifocal	Matrifocal
Forest Yam-Taro	14.1	13.8
Grassland Yam-Taro	24.6	40.1
Tilled Grassland Sweet Potato + Peanut	14.5	26.3
Forest Sweet Potato	34.6	9.7
Untilled Grassland Sweet Potato	2.1	1.5
Irrigated Grassland Taro	9.0	8.7
Irrigated Forest Taro	1.1	0.0
	100.0	100.0

Average Tuber Output per Human Consumer Unit:

Patrifocal - 963.4 kg. (68,304 kg. tubers/70.9 human consumer units)

Matrifocal - 1303.5 kg. (15,381 kg. tubers/11.8 human consumer units)

Average Tuber Output per Total Consumer Unit:

Patrifocal - 719.7 kg. (68,304 kg. tubers/94.9 total consumer units)

Matrifocal - 1011.9 kg. (15,381 kg. tubers/15.2 total consumer units)

Average Tuber Output per Producer Unit:

Patrifocal - 1202.5 kg. (68,304 kg. tubers/56.8 producer units)

Matrifocal - 1183.2 kg. (15,381 kg. tubers/13.0 producer units)

Average Tuber Output per Mean Human Dependency Ratio of Households:

Patrifocal - 2185.8 kg. (2732.2 kg. tubers/1.25 human dependency ratio)

Matrifocal - 1536.6 kg. (1398.3 kg. tubers/0.91 human dependency ratio)

Average Tuber Output per Mean Total Dependency Ratio of Households:

Patrifocal - 1645.9 kg. (2732.2 kg. tubers/1.66 total dependency ratio)

Matrifocal - 1195.1 kg. (1398.3 kg. tubers/1.17 total dependency ratio)

Average Tuber Output per Hectare Cultivated:

Patrifocal - 10,784 kg. (68,304 kg. tubers/6.3336 hectares)

Matrifocal - 10,134 kg. (15,381 kg. tubers/1.5177 hectares) hectare figures are nearly identical for both groups, although the average percentages of total tuber output indicate that these similar results are achieved by considerably different emphasis on specific garden types. The patrifocal households rely more heavily on the Forest Sweet Potato gardens whereas the matrifocal households obtain substantially greater proportions of their total amount of tubers from the Grassland Yam-Taro and Tilled Grassland Sweet Potato + Peanut combination.

To understand the implications of these differences with respect to household subsistence strategies, more detailed analysis of the variation within and between the patrifocal and matrifocal groups is necessary.

Subsistence Agriculture Strategies in Ilakia

The particular combination of garden types included in the household inventory, the area of each garden type cultivated, and the estimated tuber production of each garden type are assumed to reflect the subsistence agriculture strategy of a given household production/consumption unit. The analysis of observed variation in the strategies of the sample of Ilakian households necessitates more specific documentation than the generalized statements homogenized by the mind of the observer which comprise the bulk of anthropological literature. Although there has traditionally been ". . . a notable reluctance among anthropologists to use numerical data . . ." (Pelto and Pelto 1975:8), any attempt to understand patterned regularities in complex observed behavior requires careful quantification and systematic statistical treatment of the data. Three statistical techniques will be used in this analysis--Linear Regression, Analysis of Variance (ANOVA), and Stepwise Discriminant Analysis.

Linear Regression

The statistical technique of linear regression analyzes the relationship between two interval-scale variables, used to describe individual cases--e.g. households--on the basis of a straight-line model, $Y = a + bX$. If there is some *a priori* reason to believe that the relationship between the two variables is not linear, such as surface area to volume of a sphere, this model is not appropriate. However, it is often possible to perform a transformation of the original variables to obtain a linear relationship between the transformed variables. If it can be assumed that the relationship is linear, a line is fitted to the data which minimizes the sum of squares of the vertical distances of each point, or case, from that line. A measure of the degree of association between the two variables--i.e. how tightly clustered the individual points are about the line--is calculated, designated by "r", together with the degree of significance of that measure, "p". Not only does this technique determine the <u>degree</u> of relationship between the two variables, but also the <u>nature</u> of the relationship, which is specified by the regressed equation, in this case the linear equation $Y = a + bX$. This line, and, therefore, the relationship between the two variables X and Y, is defined by the value of "a"--i.e. the value of Y at the point of intersection of the regression line with the Y-axis (i.e. the value of y when $x = 0$)--and the value of "b"--i.e. the slope of the line. The regression equation allows the prediction of the expected value of y for any given value of x. In this sense, the variable represented by the "X-axis" is considered to be the independent variable and the variable represented by the "Y-axis" the dependent variable.

In the present consideration of subsistence agriculture strategies followed by Ilakian households, the concern is with discovering regular, significant relationships between household production/consumption unit characteristics (X-axis variables) and subsistence garden inventories (Y-axis variables). In this situation, it is reasonable to argue that the relationship is causal, although Van de Geer cautions that "It is better

. . . to consider regression lines in a correlation problem in a more modest sense, as showing how values of x_2[y] can be empirically predicted from given values of x_1[x], and vice versa" (1971:94).

Seven household characteristics are used: age class of household head, household size, adjusted number of human consumer units, adjusted number of producer units, human dependency ratio, adjusted number of total consumer units, and total dependency ratio. Thirty-two garden inventory variables are used: total area cultivated, area of each of eight garden types,[10] percentage of the total area cultivated by each household that is allocated to each of eight garden types, total tuber output from tuber-producing gardens,[10] tuber output from each of the seven tuber-producing garden types, and percentage of total tuber output for each household that is supplied by each of the seven tuber-producing garden types. The results of these linear regressions are tabulated in Table 10.

The values of "r" and "p" are nearly identical for corresponding regressions involving area data and tuber output data, and for corresponding regressions using percentage of area and percentage of output data, due to the fact that the data for area of each garden type and tuber output of each garden type are not

TABLE 10: SUMMARY OF LINEAR REGRESSION ANALYSES OF HOUSEHOLD PRODUCTION/CONSUMPTION UNITS CHARACTERISTICS VERSUS SUBSISTENCE GARDEN VARIABLES, ILAKIA VILLAGE.*

Subsistence Garden Variables	Household Production/Consumption Units Characteristics 1 Age Class of Household Head	 2 Household Size	 3 Adjusted # of Human Consumer Units	 4 Adjusted # of Producer Units	 5 Human Dependency Ratio	 6 Adjusted # of Total Consumer Units	 7 Total Dependency Ratio
Total Area Cultivated (n=36)	n.s.	r=.69 p<.001 a=.1217 b=.0297	r=.70 p<.001 a=.1008 b=.0511	r=.73 p<.001 a=.0283 b=.0979	r=.61 p<.001 a=.0225 b=.1756	r=.79 p<.001 a=.0856 b=.0433	r=.65 p<.001 a=.0397 b=.1180
Area of Forest Yam-Taro (n=36)	r=-.34 p= .022 a=.1031 b=-.0057	r=.39 p=.009 a=.0489 b=.0073	r=.46 p=.002 a=.0387 b=.0147	r=.57 p<.001 a=.0085 b=.0331	r=.38 p=.010 a=.0193 b=.0479	r=.50 p=.001 a=.0365 b=.0118	r=.65 p=.018 a=.0308 b=.0276
Area of Grassland Yam-Taro (n=36)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Area of Tilled Grassland Swt. Potato (n=33)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Area of Peanut (n=21)	n.s.	r=.42 p=.028 a=.0097 b=.0024	n.s.	n.s.	r=.40 p=.038 a=.0016 b=.0140	n.s.	n.s.
Area of Forest Sweet Potato (n=21)	n.s.	r=.39 p=.038 a=.0436 b=.0070	n.s.	n.s.	r=.37 p=.049 a=.0023 b=.0388	r=.61 p=.002 a=.0234 b=.0132	r=.67 p<.001 a=.0005 b=.0431
Area of Untilled Grassland Swt. Potato (n=5)	n.s.	r=.82 p=.045 a=.0079 b=.0050	r=.81 p=.048 a=.0045 b=.0089	n.s.	(r=.79) (p=.057) (a= -.02) (b= .04)	n.s.	n.s.
Area of Irrigated Grassland Taro (n=19)	n.s.	r=.41 p=.042 a=.0175 b=.0030	n.s.	n.s.	n.s.	n.s.	n.s.
Area of Irrigated Forest Taro (n=5)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

*
r = Pearson's product moment correlation
p = level of significance
a = Y-axis intercept of regression line
b = slope of regression line
n = sample size
n.s. = regression is not significant (p>0.05)

	1	2	3	4	5	6	7
% of Total Area in Forest Yam-Taro (n=36)	r=-.35 p= .017 a=45.4 b=-2.19	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Area in Grassland Yam-Taro (n=36)	n.s.	r=-.51 p<.001 a=26.1 b=-2.3	r=-.52 p < .001 a=27.7 b=-4.0	r=-.43 p= .004 a=30.4 b=-6.1	r=-.55 p < .001 a=37.2 b=-16.7	r=-.42 p=.006 a=25.9 b=-2.40	n.s.
% of Total Area in Tilled Grsld. Swt. Potato (n=33)	r=.34 p=.026 a=6.41 b=2.16	r=-.40 p=.010 a=27.1 b=-2.5	r=-.46 p=.003 a=30.2 b=-4.90	r=-.44 p= .006 a=35.4 b=-8.53	r=-.49 p= .002 a=41.7 b=20.4	r=-.45 p=.004 a=29.6 b=-3.51	r=-.44 p=.005 a=35.9 b=-11.4
% of Total Area in Peanut (n=21)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Area in Forest Swt. Potato (n=21)	r=-.56 p=.004 a=41.9 b=-2.5	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Area in Untilled Grsld. Swt. Potato (n=5)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Area in Irrigated Grsld. Taro (n=19)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Area in Irrigated Forest Taro (n=5)	r=-.87 p=.029 a=5.64 b=-.42	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Total Tuber Output from All Gardens (n=36)	n.s.	r=.67 p<.001 a=1208 b=344	r=.67 p<.001 a=982 b=585	r=.67 p<.001 a=249 b=1071	r=.61 p<.001 a=9.1 b=1738	r=.78 p<.001 a=760 b=512	r=.69 p<.001 a=79.1 b=1486
Tuber Output Forest Yam-Taro (n=36)	r=-.34 p=.023 a=462.9 b=-25.5	r=.39 p=.009 a=219.6 b=32.8	r=.46 p=.002 a=174 b=66	r=.57 p<.001 a=37.9 b=149	r=.38 p=.010 a=86.6 b=215.1	r=.50 p=.001 a=164 b=53.0	r=.35 p=.018 a=138.4 b=124.2
Tuber Output Grassland Yam-Taro (n=36)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

	1	2	3	4	5	6	7
Tuber Output Tilled Grsld. Swt. Potato + Peanut (n=35)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Tuber Output Forest Sweet Potato (n=21)	r=-.52 p=.008 a=1893 b= -130.5	r=.39 p=.038 a=743.5 b=119.1	n.s.	n.s.	r=.37 p=.050 a=398.2 b=662.2	r=.61 p=.002 a=399 b=226	r=.67 p<.001 a=8.8 b=7.35
Tuber Output Untilled Grssland Swt. Potato (n=5)	n.s.	r=.82 p=.045 a=89.8 b=57.4	r=.81 p=.048 a=51.8 b=101	n.s.	(r=.79) (p=.057) (a= -314.1) (b=557.9)	n.s.	n.s.
Tuber Output Irrigated Grassland Taro (n=19)	n.s.	r=.41 p=.042 a=234 b=40.0	n.s.	n.s.	n.s.	n.s.	n.s.
Tuber Output Irrigated Forest Taro (n=5)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Tuber Output Forest Yam-Taro (n=36)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Tuber Output Grassland Yam-Taro (n=36)	n.s.	r=-.56 p<.001 a=43.3 b=-4.0	r=-.57 p<.001 a=46.0 b=-6.86	r=-.46 p=.003 a=50.1 b=-10.2	r=-.60 p<.001 a=62.5 b=-29.0	r=-.49 p=.001 a=43.7 b=-4.4	r=-.33 p=.025 a=45.2 b=-9.88
% of Total Tuber Output Tilled Grsld. Swt. Potato + Peanut (n=35)	r=.37 p=.014 a=7.6 b=2.2	r=-.30 p=.042 a=25.5 b=-1.87	r=-.35 p=.020 a=28.0 b=-3.75	r=-.35 p=.020 a=32.7 b=-6.86	r=-.34 p=.024 a=35.1 b=-14.1	r=-.40 p=.009 a=29.2 b=-3.2	r=-.41 p=.007 a=35.8 b=-10.8
% of Total Tuber Output Forest Swt. Potato (n=21)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Tuber Output Untilled Grsld. Swt. Potato (n=5)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Tuber Output Irrigated Grsld. Taro (n=19)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
% of Total Tuber Output Irrigated Forest Taro (n=5)	r=-.86 p=.032 a=6.8 b=-.47	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

independently derived. The tuber output of each garden type is calculated by multiplying the area by the appropriate tuber output factor. Since the tuber output factor is a constant for each garden type, the area-output product changes the magnitude of the value for each garden type (and, therefore, the values of "a" and "b"), but does not alter the degree of association between the values of each household for each garden type. This also is true for all data derived for each garden type using area-dependent factors--e.g. labor inputs (time/area), productivity (output/time/area), etc.--and the generalizations made for relationships involving one of these classes of data would hold for all other classes.

The small differences that do exist in the corresponding regression analyses involving area data and garden output data, and for corresponding regressions involving percentage of area and percentage of output data, result from combining the estimated tuber outputs of Tilled Grassland Sweet Potato and Peanut gardens. Peanut gardens, though they produce no tubers, are included in the tuber output calculations since peanuts are a temporary crop planted on ground that is used as a Tilled Grassland Sweet Potato garden during the rest of the year. In all cases, land planted in peanuts was replanted in sweet potatoes subsequent to (and, in most cases, prior to) the cultivation of peanuts. Therefore, exclusion of Peanut garden areas from estimates of tuber output would cause an unacceptable bias in the tuber production data. Seven garden types, then, are included in the following discussions.

For the remainder of this analysis, only the tuber output and percentage of tuber output data classes are used. It must be emphasized that these output data are concerned only with the average amounts of staple tubers--i.e. yams, taro, and sweet potatoes--that are produced by given areas of specific garden types, not with total caloric output of these gardens. The production of other crops on the same plots of land and interspersed with the tubers are not considered here. The tubers, however, form the bulk of the Ilakian diet, are consumed at nearly every meal, and have no locally-produced substitutes. It is assumed, therefore, that the subsistence strategies of Ilakian households are highly determined by the planned production of these principle crops.

The linear regression of total tuber output yields moderate, highly significant correlations for all household characteristics, except age class of head of household. A scattergram plot of total tuber outputs versus total dependency ratios for each household is given as an example in Figure 5. It is important to note that the correlations with total tuber output are higest for these two variables which include the consumption requirements of pigs--i.e. adjusted number of total consumers and total dependency ratio.

The scattergram plot of total tuber output versus age class of head of household (See Figure 6) appears to show a curvilinear relationship. Therefore, the value of "r", based on a linear model, is not meaningful. Although a curvilinear model--e.g. $y = a + bx + cx^2$--has not been applied to the data, most of the regressions involving this household variable seem to exhibit this tendency. Specific exceptions are mentioned below. This would indicate that households tend to increase production into the middle age classes of the household head and then decrease production into advanced age. This aspect of temporal development in household subsistence strategies will be discussed below.

The tuber output from Forest Yam-Taro and Forest Sweet Potato gardens show, with two exceptions, low to moderate, but significant, associations with the household variables. With the inclusion of pigs as consumers in the adjusted number of total consumers and the total dependency ratio, the correlation with Forest Sweet Potato output sharply increases while that with Forest

FIGURE 5: LINEAR REGRESSION OF TOTAL DEPENDENCY RATIO VERSUS TOTAL TUBER OUTPUT.

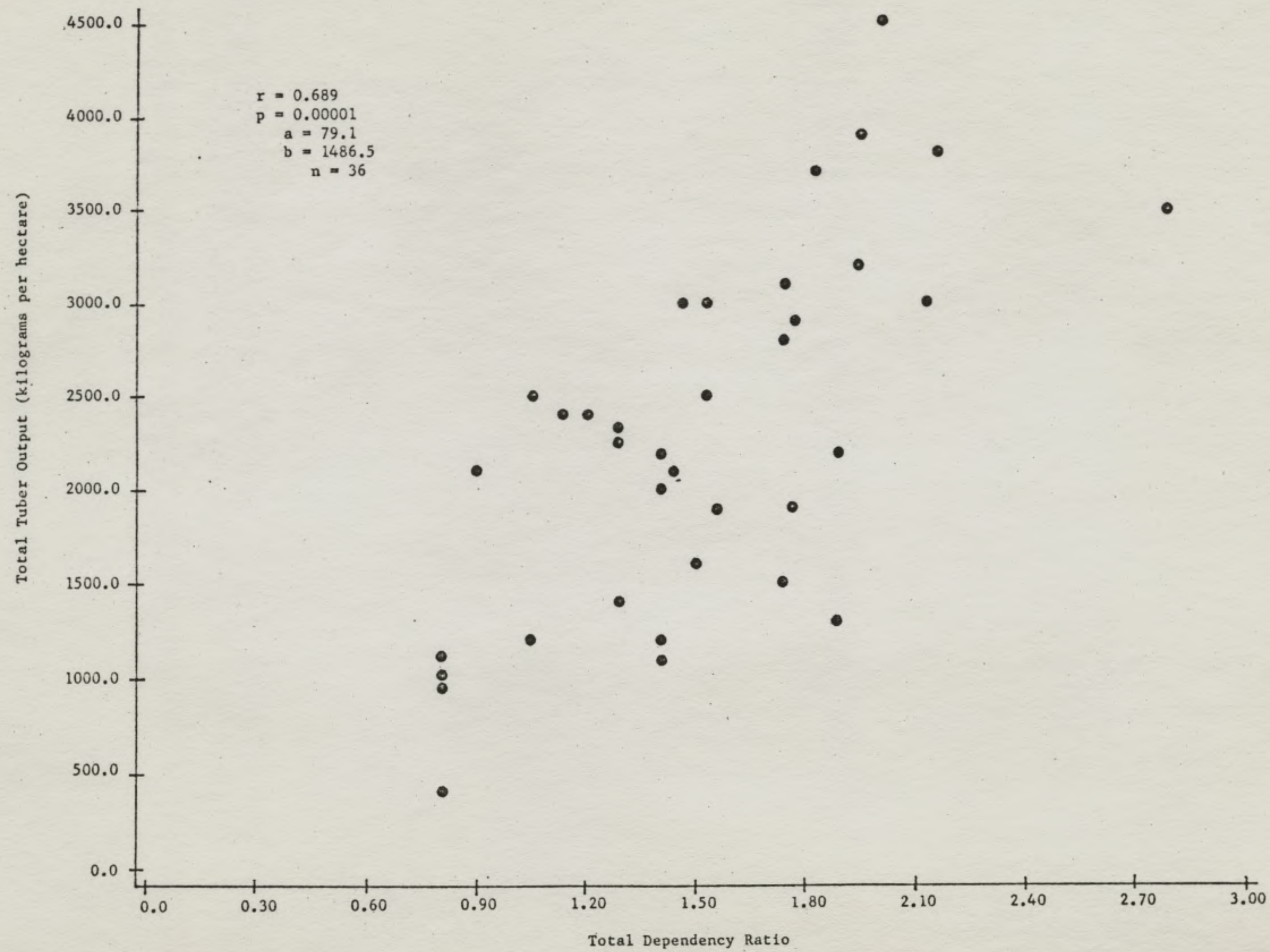
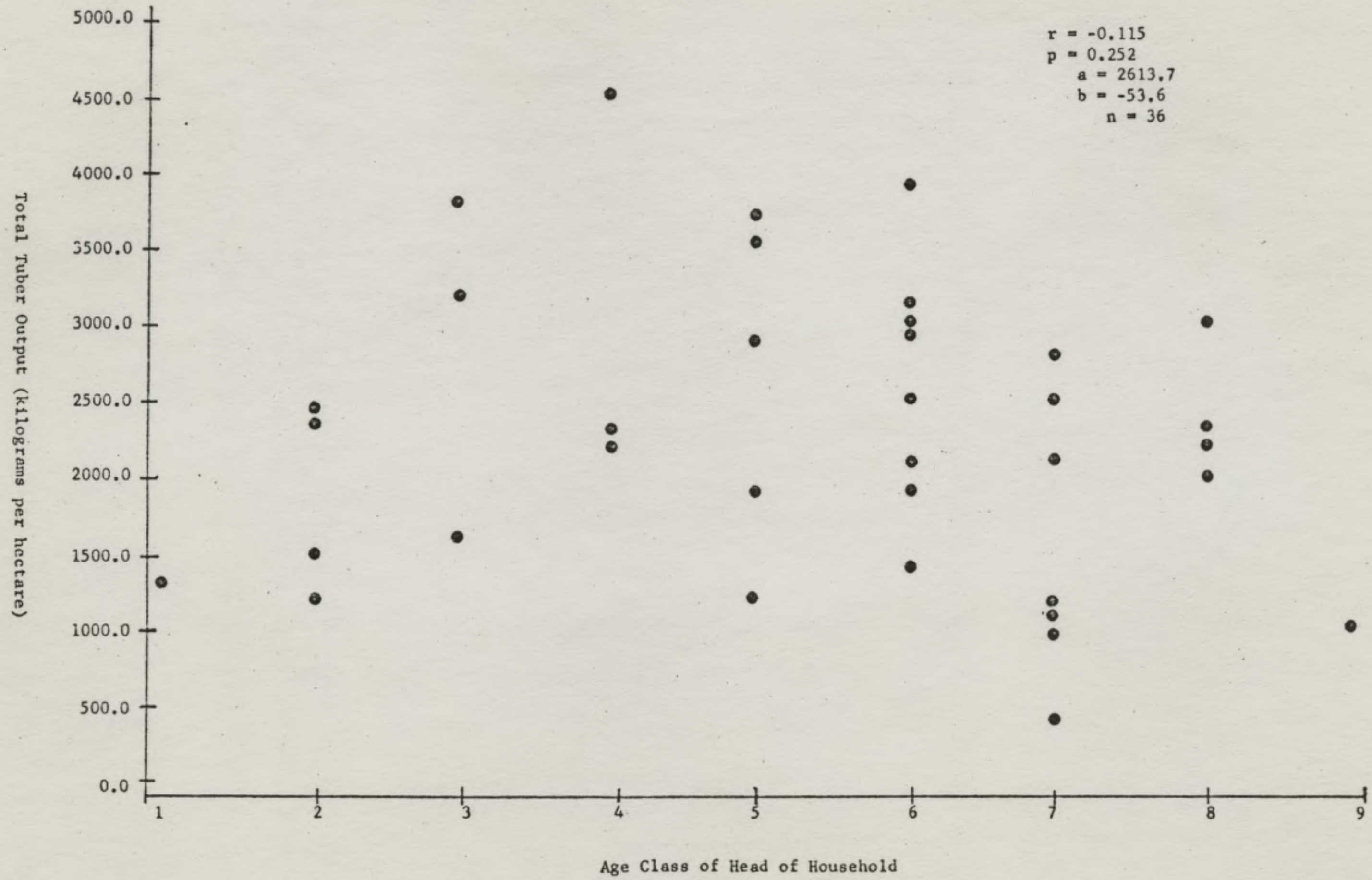


FIGURE 6: LINEAR REGRESSION OF AGE CLASS OF HEAD OF HOUSEHOLD VERSUS TOTAL TUBER OUTPUT.



Yam-Taro slightly decreases. This result is expected since the former garden type is a major source of cultivated food--i.e. sweet potatoes--for pigs. Yams and taro are very rarely given to pigs, usually only a single small cooked tuber in the context of a feast.[11] Outputs from both of these garden types also exhibit negative correlations with age class of head of household. This indicates that the older households get less food from and, correspondingly, cultivate smaller areas of these forest gardens than do younger households.

Grassland Yam-Taro, Tilled Grassland Sweet Potato + Peanut, and Irrigated Forest Taro outputs show no significant correlations with any of the household variables. With respect to our linear model, then, the relationships between the productive outputs of these garden types and the characteristics of Ilakian households are considered random.

Tuber output from the Irrigated Grassland Taro gardens show a significant correlation only with household size. This is probably due to the fact that patrifocal households, which average three times as many members as matrifocal households, cultivate 82 percent of the area allocated to this garden type and, therefore, also receive the same proportion of the output. This relationship will be explored later.

The Untilled Grassland Sweet Potato type presents an interesting case. The correlations of tuber output with household size and with adjusted number of human consumers yield the highest correlations obtained for any of the regressions. It also has a strong association with human dependency ratio, but the significance is slightly below the accepted level (included in parentheses in Table 10). When garden types were discussed at the beginning of this chapter, it was noted that the Untilled Grassland Sweet Potato plots are usually added to a household inventory to cover anticipated food shortages occurring between the periods of high productive output of the major gardens. The results of the regression analysis seem to substantiate this assertion. Larger households with many consumers would be expected to more acutely feel the effects of a food shortage and, therefore, would be more likely to make adjustments, using gardens requiring low labor inputs, to avoid the situation. Smaller households are more able to sustain themselves during lean periods by tightening their shorts and bark string aprons, and by foraging for small quantities of edible tubers in old gardens. For the larger households, which require considerable daily amounts of food even when on low rations, such strategies are more tenuous. The fact that the correlations between the two variables that include pigs as consumers--i.e. adjusted number of total consumers and total dependency ratio--are not significant, also supports the above assertion. The preparation and planting of Untilled Grassland Sweet Potato gardens are done only to relieve the anticipated distress of the human population. When food is scarce, pigs simply are not fed any cultivated food that can be consumed by humans, for periods lasting up to several weeks.

The linear regression analyses of the percentage contribution of each garden type to the total amount of tubers produced by each household versus the seven household production/consumption units characteristics show that the Forest Yam-Taro, Forest Sweet Potato, Untilled Grassland Sweet Potato, and Irrigated Grassland Taro gardens exhibit no significant straight-line patterning. In general terms, this means that Ilakian households, as defined by the seven variables, are randomly distributed with respect to the degree of reliance placed on each of these garden types as a source of foodstuffs.

The Irrigated Forest Taro has only one significant association, a strong negative correlation with age class of household head. This inverse relationship is most likely due to this garden type being made only by men and the matrifocal households in the population being headed by older women.

Of the percentage of tuber output regressions involving Grassland Yam-Taro and Tilled Grassland Sweet Potato + Peanut gardens, the only positive correlation is between the latter type and the age class of household head. While the degree of association is low, the general trend is not surprising. Since this garden does not require the difficult tasks of either clearing the forest or breaking the grassland sod, older household heads concerned with reducing the rigors of subsistence cultivation would conceivably place greater reliance on crop production from these plots. Both the Grassland Yam-Taro and the Tilled Grassland Sweet Potato + Peanut gardens exhibit low to moderate, but consistently significant, correlations between percentage of total tuber output and the other six household characteristics. Once again, this result is most likely due to the characteristics of the patrifocal and matrifocal households in the population. Since these two gardens are the most productive gardens that can be cultivated with female labor only, it is likely that matrifocal households rely more heavily on them in terms of percentage of food produced than do patrifocal households. With the average values of all household characteristics being higher for the patrifocal units, the inverse relationship between percentage of total tubers produced by these two garden types and the six household variables results.

The linear regression analysis above has isolated specific relationships between subsistence garden variables and household production/consumption units characteristics. The task remaining is to determine if patrifocal and matrifocal households exhibit significant differences in these relationships.

ANOVA and Stepwise Discriminant Analysis

ANOVA is a statistical procedure which determines whether or not subpopulations within a given population exhibit distinct distributions of values along a given dimension. To make such a determination, a sample is randomly drawn from each subpopulation and the distribution of values for given variables in each subpopulation is estimated by computing for each sample a measure of central tendency--e.g. the mean--and a measure of dispersion--e.g. the standard deviation. The comparison of these statistics makes it possible to determine, with specifiable probabilities, whether or not the subpopulations have differing characteristics with respect to one or more of the variables. The null hypothesis to be tested is that the means of the subpopulations are identical for a given variable. If the null hypothesis is true, it would be expected that the variation of the sample means about the mean of all the samples, weighted for the total sample size,(the "between variance estimate") would be approximately equal to the average of the variation of individual values in a sample from a subpopulation about the mean of that sample (the "within variance estimate"). If the null hypothesis is false, the two variance estimates will be quite different. The ratio of these two estimates, then, provides a measure of the likelihood that the null hypothesis is false. More exactly, if the null hypothesis is true--i.e. the subpopulations are not significantly different with respect to the given variables--the ratio of the between variance estimate to the within variance estimate (the "F-ratio") should be ≈ 1.0. However, should this quotient be significantly larger than unity, the null hypothesis may be rejected--i.e. the subpopulations are significantly different with respect to the given variables. The level of significance is measured by the "F-distribution" which gives the probability of obtaining a value by chance for the F-ratio as large as or larger than the one observed if the null hypothesis is in fact true.

Discriminant analysis can be used to determine which variable, or combination of variables, best distinguishes two or more subpopulations defined *a priori* by the investigator. It also provides a measure of the degree to which the groups are distinct. Generally speaking, subpopulations are best distinguished by those variables for which the mean values for the subpopulations are most different, after taking into account variability in the subpopulations for the variables in question. Once a choice of variables is made, discriminant analysis defines mathematical functions, based on those variables, which best separate the subpopulations from each other in the space defined by the given variables. The mathematical functions are used to classify individual cases into one of the subpopulations. By reclassifying the original cases, the distinctiveness of the subpopulations can be measured by the extent to which these cases are correctly placed into the particular subpopulations in which they were initially defined by the investigator. In addition, the probability of a case coming from a specific subpopulation is also computed. This probability measures the likelihood of an individual case with particular values on the chosen variables actually belonging to a subpopulation the characteristics of which are defined by the values of the cases in that subpopulation for the variables being analyzed. Graphical representation of the distinctiveness of the subpopulations is obtained by reducing the dimensionality of the space defined by the variables using what are sometimes referred to as "canonical variates."

The criteria for defining a two- or three-dimensional space which displays the distinctiveness of the subpopulations is to first select that axis through the space defined by the variables along which the greatest variability in subpopulation means occurs. The second axis is picked at right angle to the first along which the next greatest amount of variability in subpopulation means occurs. The location of individual cases is, then, redefined in terms of these new axes, and the axes may be considered as variables. This new distribution of cases exhibits the maximum differences between the subpopulation means possible in two-dimensional space. It should be noted that for analyses involving only two subpopulations the first axis will necessarily pass through both subpopulation means.

The classification procedure in discriminant analysis is based on the distance of cases from the subpopulation means for the n-variables. The distance of each case from each subpopulation mean, corrected for the variance-covariance matrix, is computed. By comparing the squared distance of each case from each subpopulation mean, individual cases are classified as more probable members of one subpopulation. That is to say, the squared distance between a case and the subpopulation means that is smallest indicates that the case should be a member of that group. However, if the distances of a case from each of the subpopulation means, corrected for the variance-covariance matrix, show only small differences in magnitude, the probability of it being a member of any of the subpopulations will be approximately equal. Thus, the probabilities are approximately 0.500 for such situations involving only two groups.

The Stepwise Discriminant Analysis Program, BMDO7M (Dixon 1971), was used to perform the discriminant analyses. The program begins by selecting the variable which discriminates most effectively between the subpopulations--i.e. has the highest F-ratio in a one-way ANOVA. The program continues by selecting the variable at each successive step which results in the greatest (significant) increase in discrimination among the subpopulations. When there are no more new variables which represent dimensions along which the subpopulations means are distinguishable, each case is reclassified with respect to the set of variables selected according to this criterion. The square of the distance of each case from each subpopulation mean (the square of the Mahalanobis distance, D^2) is computed and the posterior probabilities of each case belonging to each subpopulation are given. Finally, a scattergram plot of the first two canonical variates is made.

The population being considered in the following seven stepwise discriminant analyses is composed of all households production/consumption units in Ilakia Village. This population was stratified into two groups, or sub-populations: patrifocal and matrifocal. A 50-percent sample was randomly drawn from each stratum. Thirty-six households, or cases, comprise the total sample. The major question of concern in these analyses is whether or not the subsistence agriculture strategies of the patrifocal and matrifocal subpopulations are different, based on either the tuber outputs of seven garden types as measured for these households during one twelve-month period, or the six additional variables derived from this output data. The general null hypothesis to be tested is that the patrifocal and matrifocal subpopulations are identical with respect to the output variables for each garden type. If the null hypothesis is proved false, the discriminant analysis determines which garden type, or combination of types, represent output measures that best distinguish the two subpopulations.

The tuber output variables for each garden type are: 1) total tuber output, 2) percentage of total tuber output, 3) tuber output per adjusted human consumer unit, 4) tuber output per total consumer unit, 5) tuber output per producer unit, 6) tuber output per human dependency ratio, and 7) tuber output per total dependency ratio.

The first analysis tests the null hypothesis that there is no significant difference between the patrifocal and matrifocal subpopulations in the average amount of tubers produced from seven garden types. The results of this analysis (See Table 11), however, show that there is a highly significant difference ($F = 15.94$, $p < .001$). The Forest Yam-Taro and Forest Sweet Potato garden types exhibit the highest F-ratios, indicating that the difference between the two subpopulations, with the patrifocal producing more than the matrifocal, is greatest with respect to the production of these two garden types. Further, once they are entered in the analysis, the five remaining garden types do not significantly discriminate between the two groups. For this reason, the analysis is terminated at Step 2.

The classification of individual households shows that of the 25 households known to be patrifocal, 21 are classified as such by the discriminant analysis, and of the 11 households known to be matrifocal, 10 are so classified. This means that if an attempt were made to predict the focality of Ilakian households based on the measured amount of tubers produced by each household from Forest Yam-Taro and Forest Sweet Potato gardens alone,

TABLE 11: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

<u>F-RATIO VALUES AT STEP 2</u>

Garden Types Included ($F_{.05} = 4.14$, df = 1/33):

Forest Yam Taro	13.14
Forest Sweet Potato	10.70

Garden Types Not Included ($F_{.05} = 4.15$, df = 1/32):

Irrigated Grassland Taro	2.20
Grassland Yam-Taro	1.82
Untilled Grassland Sweet Potato	0.93
Irrigated Forest Taro	0.46
Tilled Grassland Sweet Potato + Peanut	0.01

<u>FINAL F-RATIO FOR ANALYSIS</u> (df = 2/33): $F = 15.94$, $p < .001$

<u>HOUSEHOLDS MISCLASSIFIED</u>

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership: Patrifocal	Matrifocal
KU05A		0.130	0.870
ØP01A		0.485	0.515
NØ05A		0.456	0.544
PI05A		0.237	0.763
	ØP08B	0.716	0.284

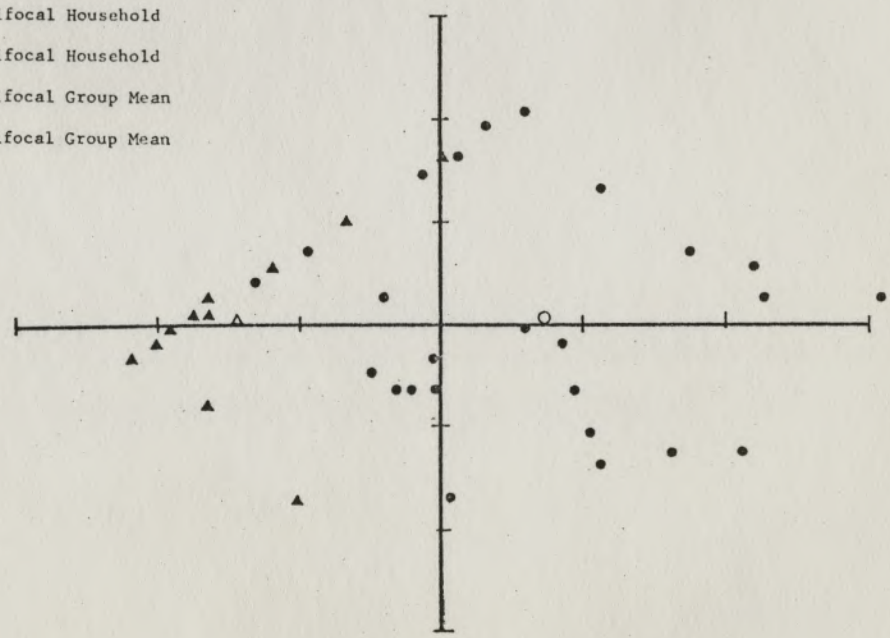
<u>SCATTERGRAM PLOT OF CANONICAL VARIABLES</u>

● = Patrifocal Household

▲ = Matrifocal Household

○ = Patrifocal Group Mean

△ = Matrifocal Group Mean



the determination of focality would be in error for about 13.9 percent (5 of 36) of the cases. On examining the posterior probabilities of each of the five cases misclassified, three deviate strongly from their group means--i.e. their posterior probabilities exceed 0.600--while two are borderline misclassification--i.e. their posterior probabilities are less than 0.600. This is affirmed by the locations of these cases on the scattergram plot included in Table 11. While five cases misclassified implies there is some overlap between the two groups, the overall pattern is highly satisfactory. The null hypothesis that there is no significant difference between patrifocal and matrifocal subpopulations in terms of the tuber outputs of garden types can be rejected.

The second analysis evaluates Ilakian subsistence strategies to determine if patrifocal and matrifocal households differ in the percentage of the total amount of tubers produced from each of the seven garden types and, if so, with respect to which garden types. This procedure compares the relative contribution of garden types to the total quantity of tuber foods available to households of the respective subpopulations.

The analysis (See Table 12) shows that only two garden types, the Tilled Grassland Sweet Potato + Peanut and the Grassland Yam-Taro, make a significant difference

TABLE 12: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON PERCENTAGE OF TOTAL TUBER OUTPUT FOR SEVIN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

F-RATIO VALUES AT STEP 2

Garden Types Included ($F_{.05} = 4.14$, df 1/33):

Tilled Grassland Sweet Potato + Peanut	11.02
Grassland Yam-Taro	8.18

Garden Types Not Included ($F_{.05} = 4.15$, df = 1/32):

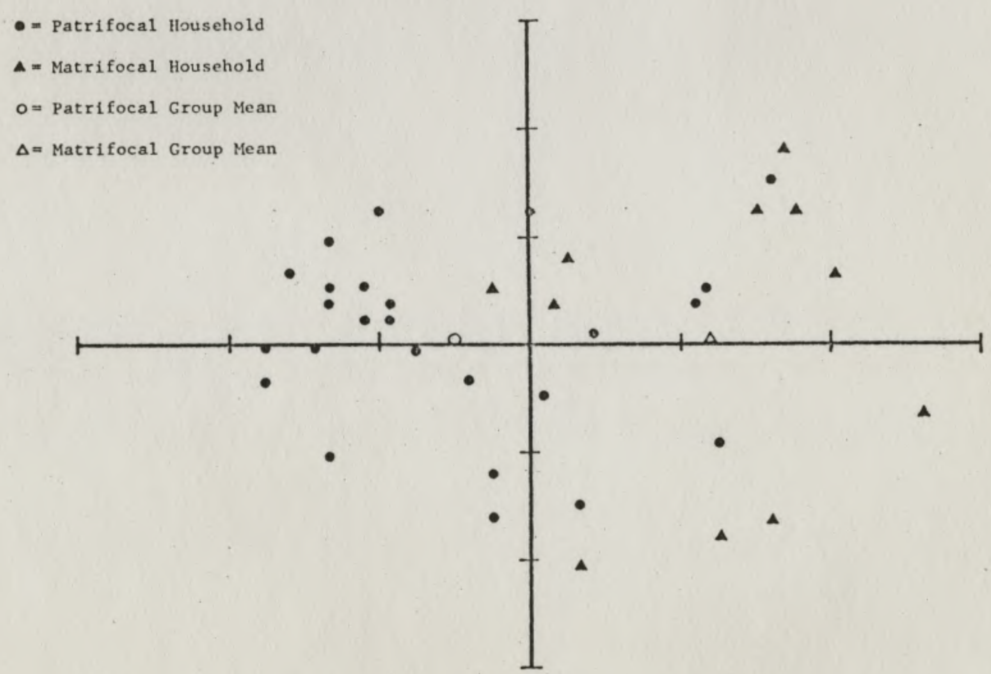
Forest Yam-Taro	2.04
Untilled Grassland Sweet Potato	0.94
Forest Sweet Potato	0.72
Irrigated Grassland Taro	0.39
Irrigated Forest Taro	0.12

FINAL F-RATIO FOR ANALYSIS (df = 2/33): $F = 10.86$, $p < .001$

HOUSEHOLDS MISCLASSIFIED

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership Patrifocal	Matrifocal
ØP08A		0.466	0.534
TA06A		0.193	0.807
TA03B		0.095	0.905
TA08A		0.500	0.500
ØP23A		0.161	0.839
PI05A		0.202	0.798
	PI01A	0.735	0.265
	PI02A	0.528	0.472
	PØ03B	0.563	0.437

SCATTERGRAM PLOT OF CANONICAL VARIABLES



between the two subpopulations ($F = 10.86$, $p < .001$). The summary classification of household admits to nine misclassifications; six patrifocal households are classified as matrifocal and three matrifocal as patrifocal. Also, five of the nine are distantly separated from their respective subpopulation means, indicating that the degree of overlap between the two subpopulations is considerable. Nonetheless, the assertion made earlier that matrifocal households rely more heavily than do patrifocal units on these two types of grassland gardens as sources of tuber foods is confirmed.

Up to this point in the discriminant analysis of subsistence strategies, the two indicators used to distinguish between the matrifocal and patrifocal subpopulations--gross total tuber output of each garden type and percentage of total output contributed to individual household food supplies--tacitly assume that all households in the population are comparable with respect to other variables that might influence either the output or the percentage contribution of each garden type. That is, factors which may have important influences on either of these two indicators are assumed to exhibit random variation among all households in both groups and, therefore, can be treated as error terms. A comparison of the values for household production/consumption units characteristics (See Table 5), however, shows that this assumption is unwarranted. The patrifocal group has larger average values than the matrifocal group for all household variables of concern here--i.e. adjusted number of human consumer units, adjusted number of total consumer units, adjusted number of producer units, human dependency ratio, and total dependency ratio. Clearly, adjustments must be made to correct for these major disparities.

To correct tuber output figures for the adjusted number of human consumer units and for the adjusted number of total consumer units, the output from each garden type for each household is simply divided by the appropriate number of human and total consumer units, respectively, which yields output of garden type per human consumer unit and output of garden type per total consumer unit. As noted above (See Table 9), the overall means for each subpopulation show that matrifocal households produce an average of 26 per cent more tuber foodstuffs per human consumer and 29 per cent more per total consumer than the patrifocal units. What is of concern to this analysis, however, is whether or not these group means are significantly different and, if so, what specific garden types are sufficient to account for the difference.

Two discriminant analyses are performed, the first using tuber output corrected for human consumers and the second using tuber output corrected for total consumers. The results are given in Tables 13 and 14, respectively. As would be expected, since these two household variables are not independent due to the fact that the latter is essentially the same as the former with an additional correction for the number of pig consumer units, the outcomes of these two analyses are very similar. Both show highly significant differences between the two groups ($F = 18.31$, $p < .001$ and $F = 22.11$, $p < .001$, respectively) attributable to the same two garden types, Tilled Grassland Sweet Potato + Peanut and Grassland Yam-Taro, with the matrifocal output values being larger than the patrifocal. Interestingly, the inclusion of pigs as consumers increases the difference between the two subpopulations. This is due to patrifocal households having a larger average number of pig consumer units which serves to further reduce the output per total consumer units and widen the difference between the two subpopulation means. In the analysis of output per human consumers, only three households are strongly misclassified, and in the analysis of output per total consumers, only four are incorrectly classified. This indicates that the overlap between the two groups, on the basis of only two garden types, is very low.

TABLE 13: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT PER ADJUSTED NUMBER OF HUMAN CONSUMER UNITS FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

F-RATIO VALUES AT STEP 2

Garden Types Included ($F_{.05} = 4.14$, df = 1/33):

Tilled Grassland Sweet Potato + Peanut	14.02
Grassland Yam-Taro	7.36

Garden Types Not Included ($F_{.05} = 4.15$, df = 1/32):

Untilled Grassland Sweet Potato	2.48
Forest Sweet Potato	0.84
Irrigated Forest Taro	0.82
Irrigated Grassland Taro	0.20
Forest Yam-Taro	0.02

FINAL F-RATIO FOR ANALYSIS (df = 2/33): $F = 18.30$, $p < .001$

HOUSEHOLDS MISCLASSIFIED

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership Patrifocal	Matrifocal
TA03B		0.140	0.864
	ØP10B	0.839	0.161
	PØ03B	0.976	0.024

SCATTERGRAM PLOT OF CANONICAL VARIABLES

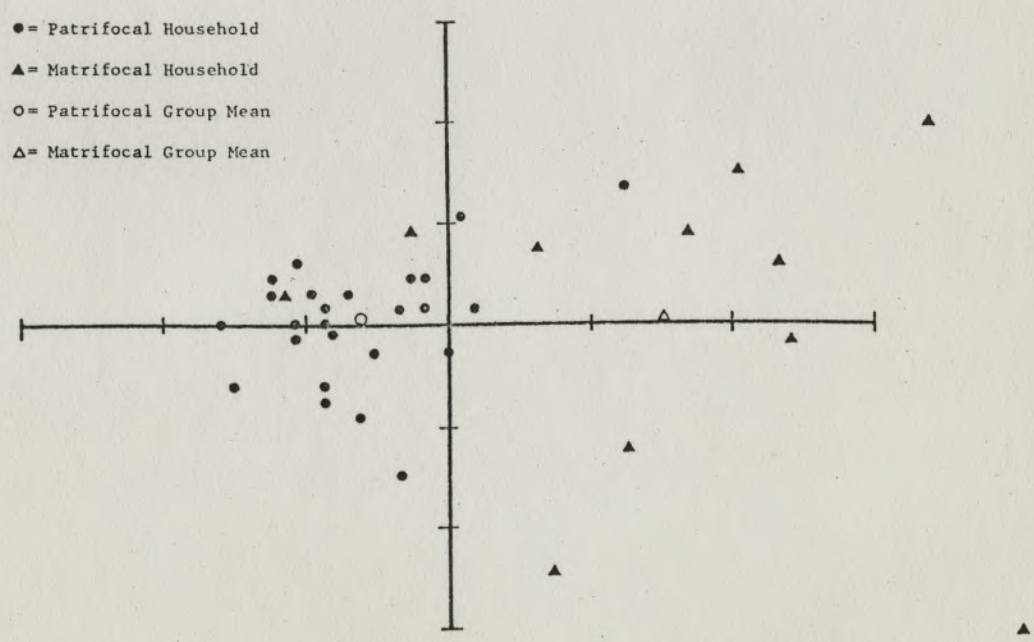


TABLE 14: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT PER ADJUSTED NUMBER OF TOTAL CONSUMER UNITS FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

F-RATIO VALUES AT STEP 2

Garden Types Included ($F_{.05}$= 4.14, df = 1/33):

Tilled Grassland Sweet Potato + Peanut	15.03
Grassland Yam-Taro	9.43

Garden Types Not Included ($F_{.05}$= 4.15, df 1/32):

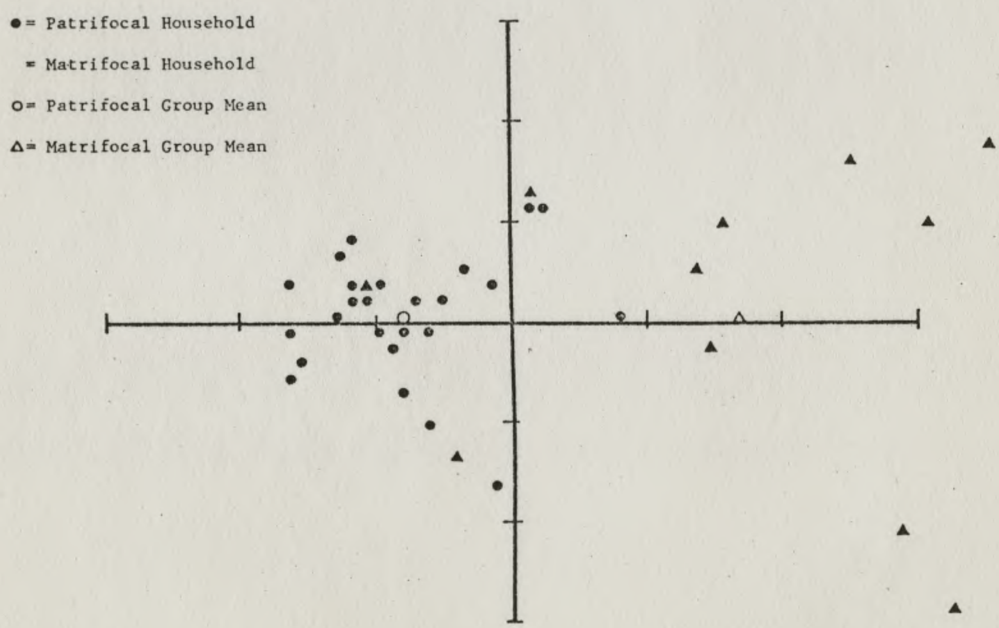
Untilled Grassland Sweet Potato	0.71
Forest Sweet Potato	0.48
Irrigated Forest Taro	0.33
Irrigated Grassland Taro	0.06
Forest Yam-Taro	0.06

FINAL F-RATIO FOR ANALYSIS (df = 2/33): F = 22.11, p<.001

HOUSEHOLDS MISCLASSIFIED

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership: Patrifocal	Matrifocal
ØP08A		0.291	0.709
	ØP10B	0.677	0.323
	PØ03B	0.977	0.023
	ØP02B	0.886	0.114

SCATTERGRAM PLOT OF CANONICAL VARIABLES



The correction of tuber output for producer units is accomplished by dividing the tuber output figure for each garden type by the adjusted number of producer units for each household. As noted above, the average of total tuber output from all seven garden types combined per producer unit is nearly the same for both groups with patrifocal units averaging only one per cent more than matrifocal units. Considered in conjunction with a similar correspondence for total garden area per producer unit noted earlier, these near identities have important implications which will be discussed later. However, for the present analysis, the concern is to determine the garden type, or combination of garden types, for which the tuber output per producer unit values facilitate the best discrimination between the two subpopulations.

The stepwise discriminant analysis (See Table 15) determines that, once again, a significant difference ($F = 0.11$, $p < .001$) between the patrifocal and matrifocal subpopulations is caused by the Tilled Grassland Sweet Potato + Peanut and Grassland Yam-Taro gardens. The tuber output per producer from these two garden types is greater for the matrifocal than for the patrifocal subpopulation. The two groups do exhibit some overlap with four patrifocal and three matrifocal households

TABLE 15: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT PER ADJUSTED NUMBER OF PRODUCER UNITS FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

F-RATIO VALUES AT STEP 2

Garden Types Included ($F_{.05}$= 4.14, df = 1/33):

Tilled Grassland Sweet Potato + Peanut	7.69
Grassland Yam-Taro	6.24

Garden Types Not Included ($F_{.05}$= 4.15, df = 1/32):

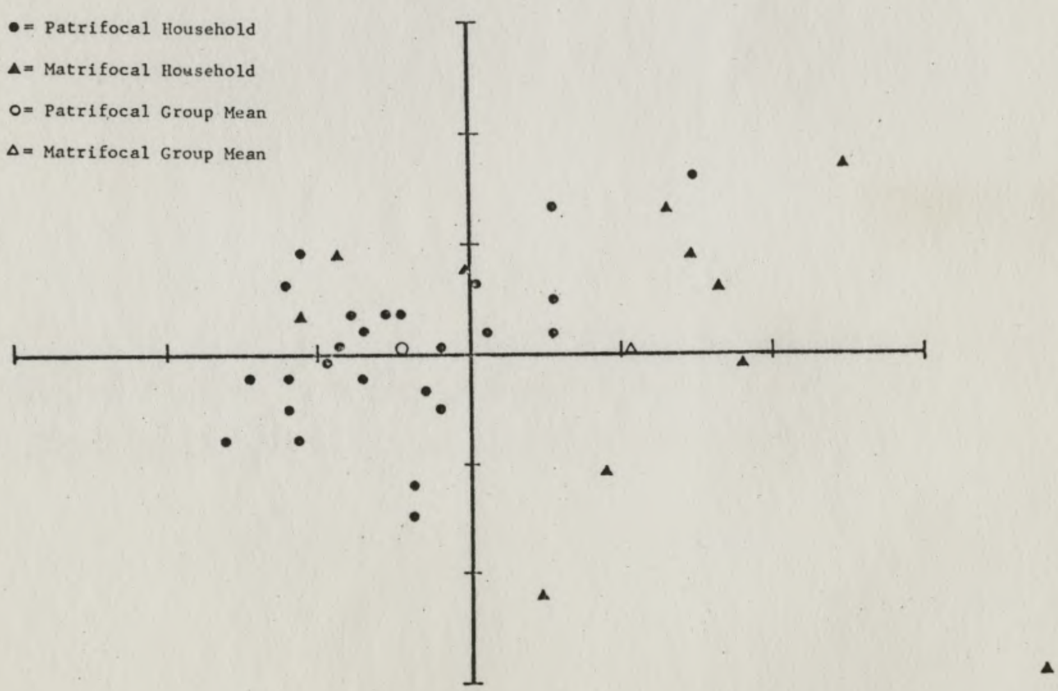
Forest Sweet Potato	2.62
Untilled Grassland Sweet Potato	2.20
Irrigated Forest Taro	1.48
Forest Yam-Taro	0.87
Irrigated Grassland Taro	0.05

FINAL F-RATIO FOR ANALYSIS (df = 2/33): F = 9.11, p<.001

HOUSEHOLDS MISCLASSIFIED

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership Patrifocal	Matrifocal
PØ02A		0.416	0.584
TA03B		0.138	0.862
PI05A		0.400	0.600
ØP14A		0.416	0.584
	ØP10B	0.871	0.129
	PI02A	0.620	0.380
	PØ03B	0.898	0.102

SCATTERGRAM PLOT OF CANONICAL VARIABLES



being misclassified.

There remains two final adjustments to be made for this consideration of tuber output production--the human and total dependency ratios. As defined above, the human dependency ratio is the proportion of human consumer units to producer units, and the total dependency ratio is the proportion of human plus pig consumer units per producer unit. The ratios express the number of consumers that each producer must support. In effect, they are indices of the relative subsistence burdens borne by the members of a given household. It is not unreasonable to surmise that differences in the relative subsistence burdens of households may influence the tuber production of each household. Since average human and total dependency ratios per household are considerably larger for patrifocal than for matrifocal units, a fair comparison of the tuber outputs of these two groups necessitates a correction for these influences. This is easily done by dividing the tuber output from each garden type by each dependency ratio of the cultivating household. Using these two sets of corrected tuber output data, the patrifocal and matrifocal subpopulations can again be compared.

The stepwise discriminant analysis involving tuber output per human dependency ratio (See Table 16)

TABLE 16: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT PER HUMAN DEPENDENCY RATIO FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

<u>F-RATIO VALUES AT STEP 2</u>

Garden Types Included ($F_{.05}$= 4.14, df = 1/33):

Forest Sweet Potato	9.33
Forest Yam-Taro	4.85

Garden Types Not Included ($F_{.05}$= 4.15, df = 1/32):

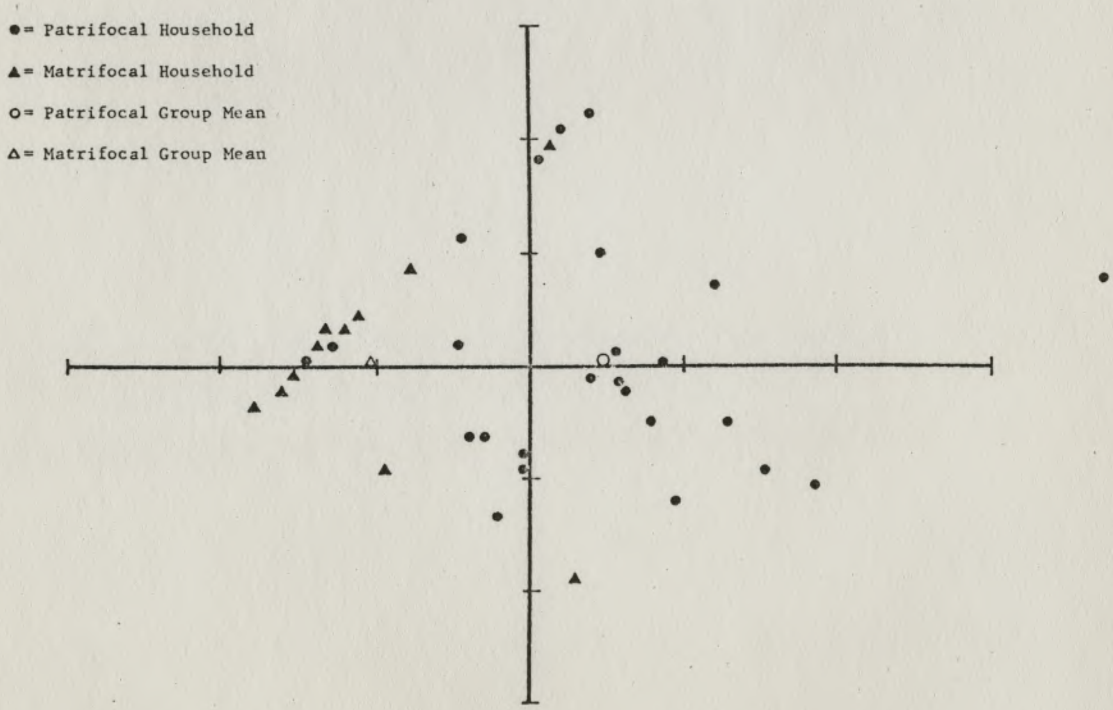
Irrigated Grassland Taro	3.32
Tilled Grassland Sweet Potato + Peanut	1.20
Grassland Yam-Taro	1.01
Irrigated Forest Taro	0.91
Untilled Grassland Sweet Potato	0.78

<u>FINAL F-RATIO FOR ANALYSIS</u> (df = 2/33): F = 7.83, p<.01

<u>HOUSEHOLDS MISCLASSIFIED</u>

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership: Patrifocal	Matrifocal
TA06A		0.430	0.570
KU05A		0.150	0.850
KU01A		0.455	0.545
ØP01A		0.440	0.560
PI05A		0.189	0.811
	PI01A	0.690	0.310
	ØP08B	0.657	0.343

<u>SCATTERGRAM PLOT OF CANONICAL VARIABLES</u>



shows that two garden types, the Forest Sweet Potato and the Forest Yam-Taro, exhibit significant differences between the patrifocal and the matrifocal subpopulations ($F = 7.83$, $p < .01$). In the second analysis (See Table 17), pig consumer units are included as part of the total dependency ratio. This results in tuber output from only one garden type, the Forest Sweet Potato, exhibiting significant difference between the two groups ($F = 12.46$, $p < .001$). In both of these analyses, the tuber output per dependency ratio for the distinguishing garden types is greater for the patrifocal than for the matrifocal subpopulations.

These findings confirm an earlier assertion that because pigs are fed virtually no produce harvest from the Forest Yam-Taro gardens, the inclusion of pig consumer units in household variables will tend to decrease the degree of association with this garden type. By the same token, correlations with the Forest Sweet Potato garden type, which is a major source of cultivated food for pigs, increase when pig population data are included.

Misclassified households in the former analysis involve five patrifocal and two matrifocal units; in the latter, seven patrifocal and two matrifocal. This amount of overlap indicates that if predictions of the focality of households were attempted using tuber output

TABLE 17: STEPWISE DISCRIMINANT ANALYSIS SUMMARY OF PATRIFOCAL (n=25) VERSUS MATRIFOCAL (n=11) HOUSEHOLDS BASED ON TOTAL TUBER OUTPUT PER TOTAL DEPENDENCY RATIO FOR SEVEN GARDEN TYPES, ILAKIA VILLAGE, 1 OCTOBER 1971 THROUGH 30 SEPTEMBER 1972.

F-RATIO VALUES AT STEP 1

Garden Types Included ($F_{.05}$= 4.13, df = 1/34):

Forest Sweet Potato	12.46

Garden Types Not Included ($F_{.05}$= 4.14, df = 1/33):

Forest Yam-Taro	3.84
Irrigated Grassland Taro	1.56
Untilled Grassland Sweet Potato	1.27
Tilled Grassland Sweet Potato + Peanut	0.75
Irrigated Forest Taro	0.57
Grassland Yam-Taro	0.09

FINAL F-RATIO FOR ANALYSIS (df = 1/34): F = 12.46, $p < .001$

HOUSEHOLDS MISCLASSIFIED

Patrifocal	Matrifocal	Posterior Probabilities of Group Membership Patrifocal	Matrifocal
TA06A		0.225	0.775
KU05A		0.225	0.775
TA03B		0.225	0.775
TA08A		0.225	0.775
ØP23A		0.225	0.775
ØP01A		0.476	0.524
PI05A		0.225	0.775
	PI01A	0.825	0.175
	PI02A	0.646	0.354

SCATTERGRAM PLOT OF CANONICAL VARIABLES

(Only one variable exhibiting significant difference, so scattergram plot is eliminated.)

per human dependency ratio for Forest Sweet Potato and Forest Yam-Taro gardens, errors would occur for about 19.4 per cent (7 of 36) of the cases; if tuber output per total dependency ratio for only Forest Sweet Potato gardens is used, errors would occur for about 25 per cent (9 of 36) of the households. With only one variable showing significant differentiation in this analysis, the two-dimensional scattergram plot is meaningless and, therefore, excluded from Table 17.

Since the success of a discriminant analysis is primarily measured by its ability to accurately discriminate between the groups being considered, misclassifications are to be minimized. For the analyses presented here, certain households are consistently misclassified. Thus, they demand closer scrutiny to determine what other factors not considered in these analyses may be contributing to their tendency to differ from the mean values of their respective groups. All households that were misclassified in any of the above stepwise discriminant analyses 1-7 are listed in Table 18. Those designated by a plus sign ("+"), were borderline misclassifications--i.e. their posterior probabilities of membership in the wrong class are less than 0.600; if designated by an asterisk ("*"), they are considered more substantial misclassifications--i.e. their posterior probabilities

TABLE 18: HOUSEHOLDS MISCLASSIFIED BY STEPWISE DISCRIMINANT ANALYSES, ILAKIA VILLAGE

<u>Hshld. Number</u>	<u>Stepwise Discriminant Analyses</u>						
Patrifocal:	1	2	3	4	5	6	7
PI05A	*	*			+	*	*
TA03B		*	*		*		*
KU05A	*					*	*
TA06A		*				+	*
ØP23A		*					*
ØP08A		+		*			
TA08A		+					*
ØP01A	+					+	+
PØ02A					+		
KU01A						+	
NØ05A	+						
ØP02A					+		
Matrifocal:							
PØ03B		+	*	*	*		
PI01A		*				*	*
ØP10B			*	*	*		
PI02A		+			*		*
ØP08B	*					*	
ØP02B				*			
Total # of Hshlds. Misclassified	5	9	3	4	7	7	9
Percentage Overlap Between Groups (N = 36)	13.9	25.0	8.3	11.1	16.7	16.7	25.0

of membership in the incorrect group are greater than 0.600.

It must be emphasized at this point that the following discussion of household misclassifications is not an attempt to explain away the variation that undoubtedly exists in Ilakia. The relatively small number of variables included here cannot be expected to account for 100 per cent of the total variation exhibited by such a complex phenomenon as subsistence agricultural strategy. Further, the discriminant analyses were performed after leaving the field site, which means that the following suggestions are based solely on my knowledge of the households involved, not on explicit questioning of the individuals involved concerning the reasons for their apparently idiosyncratic behavior. These considerations are more profitably viewed as speculations, or low-level working hypotheses, which incorporate some additional variables and to which the data conform with varying degrees of regularity. For this reason, households which do not conform with these ideas will be explicitly noted.

The misclassifications in Analysis 7 seem to be totally explained by the fact that only one garden type, Forest Sweet Potato, is used. All of the patrifocal households in the sample without this garden type are strongly misclassified. This situation also undoubtedly contributes to the aberrant status of five of the same six households in Analysis 2. By effectively increasing the relative percentage contribution of the Tilled Grassland Sweet Potato + Peanut and Grassland Yam-Taro gardens in their overall garden inventories, they again appear matrifocal. Further evidence is that the patrifocal household, ØP01A, making the smallest area of, and, therefore, having the smallest output from, Forest Sweet Potato gardens is a borderline misclassification in Analysis 7. By the same token, the only two matrifocal households in the sample, PI01A and PI02A, utilizing Forest Sweet Potato gardens are classified as patrifocal in Analysis 7.

PI05A is the only polygynous household in the sample. The additional female producer is a likely cause of its strong tendency towards matrifocal strategies.

A factor associated most frequently with misclassification of patrifocal households is wage labor migration. Seven patrifocal households listed--i.e. TA03B, KU05A, TA06A, ØP23A, ØP08A, TA08A, and KU01A--are headed by men who returned from a tour of wage labor migration after 1 September 1971. This means that the preparation and planting of all gardens used in this analysis, except the sweet potato gardens, had been finished before their arrival in the village. Therefore, the fact that they show tendencies toward matrifocal strategies is certainly expected. This situation is accentuated by the influence of the Forest Sweet Potato gardens. Since the normal period for preparation of this garden type is March through August, five of the above seven men elected not to plant this garden after their return to Ilakia. Two of the men, ØP08A and KU01A, did plant this garden and, as a result, show weaker misclassifications. Two additional heads of household, correctly classified in all analyses, also returned to Ilakia in September 1971 and both men cleared and planted Forest Sweet Potato gardens immediately after their arrival. By June 1972, four of the five returned migrants who previously had no Forest Sweet Potato gardens were preparing such plots, and the fifth had decided to rely on Untilled Grassland Sweet Potato gardens.

Households ØP01A and NØ05A are headed by the oldest men in the sample and exhibit borderline misclassifications in the analyses based on gardens requiring high male labor inputs. This likely reflects their slowly decreasing participation in subsistence agricultural activities. Households ØP02A and PØ02A show slight misclassifications resulting from producing more tubers per producer unit in the Tilled Grassland Sweet Potato +

Peanut and Grassland Yam-Taro gardens than is expected for the patrifocal subpopulation. Members of these households are recognized by other Ilakians as being "strong" gardeners. These two cases also have the third and fourth highest total dependency ratios in the sample and evidently are responding to the high level of relative subsistence burden.

Of the matrifocal households in the sample, PØ03B and Ø02B are the only ones including unmarried adult sons as producers. Their subsistence strategies show marked aberrations from the matrifocal group. The latter responds in a predictable manner, being misclassified as patrifocal in Analyses 1 and 6 due to higher than expected values for the variables based on Forest Yam-Taro gardens. The former, however, is misclassified as patrifocal in Analyses 2, 3, 4, and 5 due to lower than expected values for variables involving output from Tilled Grassland Sweet Potato + Peanut and Grassland Yam-Taro gardens. A possible, though unconfirmed, reason for this situation is that the woman is a relatively recent widow. It may be the case that her production activities are curtailed during an extended mourning period. A young son of the same woman died from a snake bite shortly after my arrival in Ilakia and the woman continued to show obvious signs of bereavement--e.g. filthy, ragged dress and occasional outbursts of wailing--throughout my period in residence.

Household ØP10B is an elderly woman misclassified as patrifocal due to low levels of output per consumer and per producer units. The activities of this woman are periodically limited by the reinjury of an improperly healed childhood fracture of her lower right leg. During most of the research period, she had only partial use of this leg. A slight bumb had resulted in an enormous festering wound covering the entire length of her shin and exposing the bone in several places.

As noted above, the aberrant strategies of PI01A and PI02A are largely due to their use of Forest Sweet Potato gardens. The low value of the latter household with respect to output per producer is unexpected. This woman died during the research period, but according to information collected at the time of her death, it was not the result of a prolonged illness, which might have caused a low level of production in her grassland gardens.

Matrifocal household ØP02B is the only wife of an absent migrant laborer included in the sample. Her low value for output per total consumer units, and, therefore, her misclassification as patrifocal in Analysis 4, results from her feeding nearly twice as many pig consumer units as any other household in the matrifocal subpopulation.

Summary

The thrust of the argument in this chapter has been to demonstrate the flexible nature of the subsistence agriculture system in Ilakia. The organization of subsistence production demands that all households perform nearly identical tasks during two periods of the year, but allows selection by individual households from a number of alternatives during the other two periods. The requirements of each household production/consumption unit, determined by specific characteristics, are met by manipulating the resources controlled by the individual households, land and labor. In addition to the limiting effect of household characteristics, the options available also are subject to the constraints of a specific number of well-defined garden types, rules of access to garden land, the ability to obtain auxiliary labor from outside the household, and a simple, but strict, division of tasks by sex. The planned and patterned selection of alternatives available results in subsistence agriculture strategies that are significantly different for patrifocal and matrifocal households. In general, the strategy of the patrifocal subpopulation involves cultivation of a greater number of plots and utilization of a wider variety of garden types during the annual subsistence cycle, more frequent sponsorship of group gardening activities, and greater reliance on Forest Yam-Taro and Forest Sweet Potato gardens, which require major inputs of adult male labor. The strategy of the matrifocal subpopulation, on the other hand, tends to employ fewer plots of less diverse garden types, relies on the assistance of auxiliary labor provided by individual adult men, and emphasizes Grassland Yam-Taro and Tilled Grassland Sweet Potato, which can, in most cases, be cultivated without any male labor. Although all of the analyses carried out show highly significant differences between the two subpopulations, the multiplicity of important variables, only a few of which were included in the analyses, causes some overlap of specific households when attempting to distinguish between the two subpopulations. Several additional factors--e.g. age, illness, polygny, resident unmarried adult men, wage labor migration, mourning practices, etc.--were suggested as possibly contributing to this imperfect discrimination. One of these, participation in wage labor migration, is of considerable importance and will be treated in the next chapter.

Notes

1. Hatch (1973) traces the historical development of "the upsurge of interest in economic, subsistence and ecological factors beginning about the late 1930's" in American anthropology.

2. R. Loving (1972) says that the Mobuta Awa used to grow large quantities of peanuts and, in fact, introduced them into Ilakia. At present, however, the Mobuta Awa have greatly curtailed peanut production and the Ilakia Awa plant more than any village in the area.

3. In fact, stories are told about one old woman who used to successfully hunt tree-dwelling marsupials by climbing trees and clubbing the nocturnal beasts in a manner still used by men and boys. This is the same woman, however, who used to grab a bow when angry at her husband and shoot arrows at him. Both of these behaviors are considered very unusual for a woman.

4. There was one widower head of household (40-44 years of age) when I arrived in Ilakia, but he began cohabitating with a widow (35-39 years of age) during 1972. The exact date of death of his first wife is not known and, since there is no formal ceremony for remarriage of such persons, the exact date of remarriage also is not known. During the interim period, which could not have been more than five years nor less than 2-1/2 years, he gardened with his widowed mother. Incidentally, this is the man who was killed in December 1972, the details of which are related in Chapter One.

5. A hand compass and steep tape were used for measuring the angles and distances along the entire perimeter of all subsistence and coffee garden plots. Since Ilakian gardens tend to be very irregular in shape, calculation of the area of each plot was accomplished by drawing each garden to scale on high quality recording chart paper. Each of these garden maps was trimmed to size and the resulting paper cut-out of each garden was weighed on an electronic balance. The weight of each paper cut-out was then multiplied by a conversion factor to yield the area of the specific plot. I am confident that the combined

errors in this procedure, including the inaccuracies in field measurement and subsequent mapping and the measured variation of $\pm$ 1 per cent in the weight of the recording chart paper, do not exceed $\pm$5 per cent of the actual area of any given garden. I would recommend, however, the more orthodox, and less laborious, procedure for calculating the area of irregular plots described in Breed and Hosmer (1958). I thank Mr. Robin Hide for bringing to my attention this more efficient technique.

6. Sahlins (1971:33) states that the dependency ratio is a measure of the "relative working capacity" and "an index of domestic economic strength in relation to . . . appointed tasks of livelihood" for the households. As such, the dependency ratio decreases as the "relative working capacity" of a household increases. This terminology and the inverse relationship between the index and the phenomenon being indexed introduce unnecessary confusion. "Relative working capacity" of a household should involve only the number of workers available (with appropriate adjustments being made for sex, age, etc.), but should not be concerned with the number of consumers in any way. "Relative subsistence burden" more accurately describes what the index actually measures and has the added advantage of having a direct relationship to that index--i.e. as the magnitude of the "burden" increases, the value of the index (dependency ratio) also increases.

7. The formula used for t-tests follows Blalock (1960: 175):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s_1^2/(n_1-1) + s_2^2/(n_2-1)}}$$

Since the Ilakian population is small, the usual assumption of an infinite population is not appropriate. A finite population size correction (Hays 1963:210) is used to adjust the estimate of population variance.

$$\hat{s}^2 = \frac{N(T-1)}{(N-1)T}\, s^2$$

The Ilakian sample is 50 per cent of the total population. Therefore, T = 2N and the above correction reduces to the following:

$$\hat{s}^2 = \frac{2N-1}{2(N-1)}\, s^2 = \frac{N-0.5}{N-1}\, s^2$$

Also, variances in the sample numbers are unequal, so degrees of freedom cannot be calculated in the usual manner. The following estimate is used (Blalock 1960: 176):

$$df \approx \frac{[s_1^2/(n_1 - 1) + s_2^2/(n_2 - 1)]^2}{[s_1^2/(n_1 - 1)]^2 1/(n_1 + 1) + [s_2^2/(n_2-1)]^2 1/(n_2+1)} - 2$$

8. The test for proportions used is the following (Blalock 1960:177-8):

$$Z = \frac{p_{s_1} - p_{s_2}}{\sqrt{\left(\frac{n_1 p_{s_1} + n_2 p_{s_2}}{n_1 + n_2}\right)\left(1 - \frac{n_1 p_{s_1} + n_2 p_{s_2}}{n_1 + n_2}\right)}\sqrt{\frac{n_1 + n_2}{n_1 n_2}}}$$

9. Sugarcane gardens produce no tubers and are, therefore, not included. Peanut gardens also do not produce tubers. However, this garden type is a temporary phase of the Tilled Grassland Sweet Potato garden, so the area and calculated output of sweet potatoes is added to the figure for other plots of Tilled Grassland Sweet Potato gardens.

10. The single Sugarcane garden has been excluded from this part of the analysis.

11. The taro observed being given to pigs was always cooked, but informants said that they occasionally gave their pigs raw taro. Such pig food was said to never include the large taro tubers ("mothers") consumed by humans, but only the small immature tubers ("children") which radiate out from the parent plant. These are considered inedible for humans. Yams never were observed being fed to pigs and most informants said that they had never done so and could not imagine doing so. One informant, however, said he had given his prize sow an edible yam several times during her lifetime. The reason stated for doing this was that although pigs cannot speak, they can understand at least the gist of human conversation, a belief commonly held by Ilakians; at a feast, pigs in the vicinity hear people talking about and see people eating "good" food, and the pigs become very angry. To pacify their anger and keep them from becoming feral, the owner of the pigs should occasionally give them a small portion of the food cooked for humans. At any rate, in contrast to sweet potatoes, only negligible amounts of taro and yams are consumed by pigs.

CHAPTER FOUR

WAGE LABOR MIGRATION

Throughout the Third World, the exposure to commercial goods of industrial manufacture has resulted in profound changes in the lifestyle of most people. Economies based on what has been called "limited wants" quickly shift toward economies of "unlimited wants" or, at the very least, reorganize their resources to meet the increased desires of individual participants. As with many other strong desires--e.g. various addictions--the persons who introduce the valued goods are also the only suppliers. Therefore, the acquisition of such commodities forces some degree of participation in the suppliers' system. This usually involves an exchange of resources beneficial to the "supplier" and controlled by the "buyer" for products desired by the "buyer" and produced by the "supplier."

In the case of the Third-World-as-Buyer, the resources at their command which can be effectively manipulated in the exchange relationship with industrial powers are few and basic: 1) natural resources--e.g. land, scarce mineral and precious gem deposits, petroleum, shells, various species of wild plants and animals, etc.; 2) selected domesticated crops--e.g. spices, coconuts, bananas, coffee, poppies, rubber, etc.; 3) art objects and handicrafts; and 4) labor. Most of these resources, however, are either confined to specific geographical regions, are extremely limited in supply and thus quickly overexploited or eliminated, or are dependent on the slow and costly process of organizing and constructing suitable transportation and other communication facilities. Labor stands out as the obvious exception. Universally available, valuable, relatively easy to exploit, and abundant, human labor has been the major resource most often offered by the Third World and accepted by the industrial countries in their initial exchange relationships.

Papua New Guinea is certainly no exception to this generalization.[1] All of the early expatriate residents, whether coastal planters, fishermen, gold miners, bird of paradise plume hunters, or government officials, relied on indigenous laborers to assist in their ventures. Like most resources, labor is more valuable when aggregated than dispersed. Therefore, to participate in wage earning opportunities, most laborers must terminate subsistence activities in their resident villages and migrate to the locations of employment. Such population movements are so common in Papua New Guinea that Brookfield, in 1960, called labor migration "the most widespread form of economic development" (1960:237-8). For isolated villages, such as Ilakia, which do not have ready access to roads and other communication facilities, labor migration still provides the most extensive social and economic contact with the industrial world.

The impact of wage labor migration on the local subsistence production systems of villages from which the workers come has been largely overlooked in the literature to date. Numerous studies focus on the adjustments of the workers to their usually urban work-sites (See especially Dakeyne 1967, Graves 1970, Hitchcock and Oram 1967, Little 1962, Lloyd 1967, Mayer 1961, Salisbury and Salisbury 1972, UNESCO 1956.) Other investigations postulate general causes of labor migration (See especially Gulliver 1960, Harris 1972, Mitchell 1959, Tarver 1960) or survey regional demographic and socio-cultural changes associated with labor migration (See especially Berg 1965, Brookfield 1960, Colson 1960, Hance 1970, Hogbin 1958, Schapera 1947, Wallerstein 1965, Ward 1971). Several studies point out the effects of absent and returned labor migrants on tribal groups and villages (See especially Baxter 1973, Brown 1972, Gulliver 1955, Harris 1959, Oram 1968, Read 1942, Rowley 1966, Salisbury 1962b, Skinner 1960, 1965, Southall 1954, van Velsen 1961, Watson 1958, 1959, Wilson 1941), but these tend to be generalized accounts and do not give specific information on the adjustment of local productive systems to wage labor migration.

The approach taken here views wage labor migration as a new external resource available to village residents which, if properly exploited, provides access to valued cash and commercial goods. Exploitation of this alternative resource, however, requires a major demographic dislocation of the local population in the form of adult males leaving the village for extended periods of time. The labor force remaining in the village must make certain adjustments in the production of subsistence requirements to compensate for the absence of adult males. Specific changes resulting from this type of demographic shift will be discussed later, but first an examination of the actual participation of Ilakian men in wage labor migration is necessary.

Participation in Wage Labor Migration by Ilakian Men

The wage labor opportunities available to Ilakians and other residents of rural villages in Papua New Guinea can be roughly divided into three types: unskilled casual labor, agreement labor, and semi-skilled/skilled casual labor. Each type of work opportunity can be characterized by the formality of the employer-employee agreement, duration of the labor commitment, necessity to change the worker's residence location, prior work experience or skill requirements, and earning potential. The three types of employment, then, offer distinct alternatives to prospective laborers and exhibit different patterns of participation by Ilakian men.

Unskilled Casual Labor

Unskilled labor refers to work assignments that do not require special preparation or training--i.e. tasks which any Papua New Guinean man of employable age is capable of performing. Such employment is usually short-term, lasting from a few hours to several months. Often the worker is hired to complete a single given task; when the task is finished, the employment is terminated. Examples of such jobs include cargo carriers or interpreters on a particular government foot patrol, harvesters of seasonal crops, and temporary laborers on public works projects. The labor agreement is usually casual--i.e. the employer and employee verbally agree on the conditions of employment, but either party may withdraw from the agreement at any time. In most cases, if the worker must leave his home village, the employer provides food and shelter during the period of employment. The informal nature of the employment agreement, however, places few commitments on either the employer or the employee. The employer may terminate the worker at any time, and the employee may leave at will. The advantage of this type of work arrangement for the employer is that it allows him to make temporary adjustments in his work force to fulfill short-term needs; the disadvantage is that his work force is very unstable with a high turnover rate. For the employee, this type of employment allows him to regulate the amount of time spent away from his home village, so it need not interfere with local subsistence labor requirements; the major disadvantage is the low earning potential. In the early 1960's, average pay scales, with room and board included, were 20¢ on a per diem basis and $2-3 on a monthly basis.[2] Brookfield (1961:306-307), using a ten per cent sample of all casual laborers officially registered with the government by their employers in 1956-57, states that 79 per cent of the workers in the sample received 25 shillings (≅A$2.50) per month or less. Also, only three per cent of workers in coffee and other agricultural activities earned over one Australian pound, fifteen shillings (≅A$3.50) per month. By 1972, wages had increased to about 30-40¢ per day and A$4-6 per month (See Densley 1972, Langmore

1972) with the higher rates being paid in the towns, where enforcement of the A$6 per month minimum wage is more active.

As with most other Highland New Guinea residents, unskilled casual labor was the initial type of wage labor alternative available to Ilakian men. As cargo carriers and interpreters on exploratory patrols in the late 1950's, the skill requirements were no obstacle and recruitment took place in the village. The duration of time spent away from the village ranged from a few hours to several weeks, so no serious disruption of the local subsistence activities was necessary. Beginning in 1959, Ilakians ventured further from the village to take advantage of the unskilled casual labor opportunities in the Kainantu and Wonenara areas (See Chapter One for details of this employment). The extent of at least minimal participation in unskilled casual employment is evidenced by the fact that all adult Ilakian men living in 1972 stated that they had taken part at least once in this type of labor. Several of the older men, however, admitted that they had worked as cargo carriers on only one government patrol and had done so only after considerable pressure from the commanding patrol officer. From 1959 through 1971, Ilakian men all told spent approximately 26 man-years as unskilled casual laborers with total estimated earnings not exceeding A$900, a maximum average of about A$35 per man-year.

At present, unskilled casual laborers from Ilakia are mainly younger unmarried men who are too young to sign formal work agreements. A small group of these individuals usually walk to Kainantu to seek jobs as coffee-pickers on the nearby plantations or as temporary construction laborers on public works projects. This initial work experience provides exposure to the strict work regime of wage labor and to the Neo-Melanesian language, and is viewed as preparation for the now inevitable agreement labor tour on a coastal plantation. Occasionally, older married men will accompany the youths to earn small amounts of cash needed to meet immediate obligations of taxes, exchange debts, new tools and clothing, etc.

Agreement Labor

Agreement labor migration is based on the signing of a formal written employment contract with the obligations of both employer and employee carefully enumerated and regulated by legal statutes. Since 1950, agreement labor arrangements ahve been controlled by the government-sponsored Highland Labour Scheme (HLS), with headquarters in Goroka.[3] Prospective workers go to their Subdistrict Office and announce their intentions to sign labor contracts. The Assistant District Commissioner provides these individuals with food, lodging, and transportation to the HLS compound in Goroka. After a medical examination, those deemed physically sound are organized into groups to fill requests made to the HLS by prospective employers. Each worker signs a written contract detailing the site and conditions of employment for a period of 26 lunar months--i.e. two calendar years. The laborers are given smallpox vaccinations and triple-antigen injections, provided with personal accessories--e.g. blanket, towel, shorts, "laplap," soap, tobacco, and matches--and transported by plane, boat and truck to the work locations. Although the government does employ some agreement laborers on public works projects, forestry stations, etc., the vast majority of agreement workers are under contract to private copra, cocoa, and rubber plantations located in the coastal and insular regions of Papua New Guinea (See Department of Labour, TPNG 1964-1970).

While participation in the agreement labor program involves an extended absence from the home village, association with unknown, sometimes hostile, groups of workers from other regions of the country, adjustment to a hot, tropical climate, adherence to a five-and-one-half-day (44-hour) work week, and relatively low wages, it does offer several advantages to unskilled, inexperienced villagers. First, from the day the workers volunteer for agreement labor at their local Subdistrict Office until they return to that office approximately two years later, all food, clothing, lodging, and medical services (average value of A$143 per year [Commonwealth of Australia 1972]) plus transportation are provided by the employer. Second, individuals from the same village may sign up together and serve their entire term as a group at the same location. Third, the payment of approximately one-half of their wages is deferred until termination of the contract and paid in one lump sum. For these reasons, the agreement labor program provides a ready entrance into the migrant labor market for workers who lack the experience, the skills, and in many cases, the language and educational requirements, for the more lucrative forms of employment.

The most intensive form of participation in the labor market by Ilakian men has been as agreement workers. Although the opportunity of labor migration was made available to them by the mid-1950's, and four men from the neighboring village of Tauna did sign contracts in October 1958 (Patrol Report, Kainantu, No. 4 of 1958/59), Ilakians did not respond to the recruiting efforts of government patrol officers until 1963.

As shown in Chapter One, the years immediately preceeding this time were not characterized by a reluctance to engage in other forms of wage labor. On the contrary, several individuals had worked for periods of up to one year in Kainantu and many others had spent shorter periods of time in both Kainantu and Wonenara. Nevertheless, contracting to spend two years at an unknown location on the tropical coast in a disciplined work routine with workers from places of which they had never heard was a commitment Ilakians did not readily assume. Older men also expressed fears about the safety of the village if the young men were absent. The government had officially outlawed warfare, but the patrols were infrequent and the penalties for fighting were light. Village elders discouraged plans for labor migration by reminding the young men that their most recent enemies, the villages of Tauna and Tawaina, had suffered deaths at the hands of Ilakian warriors which were as yet unrevenged; a poorly defended village would leave Ilakian women, children and pigs at the mercy of any attempts to settle these accounts.

Such fears were finally overcome in May 1963 when 5 young married men and 10 single men, together with four men from Tauna and one from Abomatasa, announced to a visiting patrol officer that they wanted to go to the coast to work. Two pigs were killed for a feast and the migrants' net bags were stuffed with food by wailing female relatives as they followed the patrol back to Okapa. They were transported later to Goroka where they were separated into two work groups. Their contracts were signed on 28 June 1963. During the following decade, eighteen separate groups of Ilakian men volunteered for agreement labor migration (See Table 19).

Once reservations concerning labor migration had been put aside, participation in the program steadily increased throughout the 1960's. By 1972, 55 men (70 per cent of the male population 15 years of age and over) had worked as agreement laborers, with 21 individuals having made only one two-year contract, 25 having made two contracts, and 11 having made three contracts. Of this total of 104 contracts signed, seven were broken by workers leaving the employment site, one was not finished due to death by illness,[4] one was terminated by a conviction for murdering a co-worker,[5] and ten are still in force. Eighty-five were successfully completed in accordance with the terms of the agreement. Ilakian men have spent over 180 man-years under labor contracts with total earnings being approximately A$9200. Of this total, about A$2860 was paid to the workers during the period of their employment in small monthly allowances ranging from 50¢ to A$2 per month. For the remaining

TABLE 19: AGREEMENT LABOR MIGRATION GROUPS AND EARNINGS, ILAKIA VILLAGE

1	2	3	4	5	6	7	8	9	10	11	12
Migration Group Number	Work Site	Number Signing Agreement	Date of Agreement Signing	Number Terminating Early	Number Completing Agreement	Date of Agreement Completion in Goroka	Approx. Total Man-Years Employed	Total Wages Received at Work Site (A$)	Total Deferred Wages Paid on Completion (A$)	Total Wages Earned (A$)	Approx. Value of Cash and Goods Returned to Ilakia (A$)
1.	Sivigolo Estate, Kwikila, Papua	6	28 June 1963	0	6	16 July 1965	12.3	138.00	369.00	507.00	138.00
2.	Karag and Wetpie Pltn., Namatanai, New Ireland	9	28 June 1963	0	9	16 Aug. 1965	19.2	216.00	544.50	760.50	544.50
3.	Talilis Plantation	4	24 Feb. 1965	0	4	4 Nov. 1966[a]	6.8	80.00	203.00	283.00	203.00
4.	Doa Estate, Kanosia, Kairuku, Papua	2	4 Mar. 1965	0	2	16 Mar. 1967	4.1	49.00	121.50	170.50	121.50
5.	Onamarang Pltn., Namatanai, New Ireland	5	10 Mar. 1966	0	5	25 Mar. 1968	10.2	167.50	325.00	492.50	325.00
6.	Martin Plantation, Kerevat, New Britain	6	10 Mar. 1966	0	6	25 Mar. 1968	12.2	222.00	368.40	590.40	368.40
7.	Kurwina Plantation, Sohano, Bougainville	6	10 Mar. 1966	1[b]	5	14 May 1968	12.6	154.00	433.03	587.03	367.10
8.	Itikinumu Plantation, Sogeri, Papua	7	25 Feb. 1967	1[c]	6	28 Feb. 1969	13.0	281.00	416.64	697.64	416.64
9.	Karu Plantation, Namatanai, New Ireland	7	12 May 1967	0	7	23 May 1969[d]	14.2	273.00	547.10	820.10	309.92
10.	Lakalot Plantation, Kavieng, New Ireland	5	16 Mar. 1968	0	5	13 Apr. 1970	10.4	176.25	415.10	591.35	415.10
11.	Undor Plantation, Namatanai, New Ireland	3	27 Apr. 1968	0	3	21 May 1970	6.2	168.00	194.67	362.67	194.67

TABLE 19 (continued):

1	2	3	4	5	6	7	8	9	10	11	12
12.	Londolovit Estate, Lahir Island	13	20 Aug. 1968	1[e]	12	7 Sept. 1970	26.6	264.00	1167.24	1431.24	1167.24
13.	Lolobau Plantation, Talasei, New Britain	3	29 Sept. 1968	1	2	19 Aug. 1971[f]	5.8	138.88	187.74	326.62	187.74
14.	Karias Plantation, Namatanai, New Ireland	11	29 Sept. 1968	0	11	14 Oct. 1970	22.5	369.00	896.72	1292.72	896.72
15.	Koitaki Plantation, Sogeri, Papua	6	27 Aug. 1969	5[g]	1	8 Sept. 1971	3.7	66.50	81.52	148.02	81.52
16.	Londip Plantation, Kokopo, New Britain	1	10 Dec. 1969	0	1	13 Dec. 1971	2.0	67.50	75.50	143.00	75.50
17.	Robinson River Plantation, Abau, Papua	4	6 May 1971	---	---	------	---	----	----	----	----
18.	Koitaki Plantation, Sogeri, Papua	6	4 June 1971	---	---	------	---	----	----	----	----
	TOTALS	104		9	85		181.8	2857.63	6346.66	9204.29	5812.55

[a]According to informants, these agreements were officially completed after 20 months following an altercation with the plantation manager. The workers refused to return to the plantation after a court hearing which determined that they were not guilty of any criminal acts. They were subsequently returned to the Highlands.

[b]One member of this group killed a fellow worker, who allegedly made homosexual advances, about two months before completion of the agreement. He was tried, convicted, and sentenced to four years in prison. He has not returned to Ilakia.

[c]One member of this group broke his contract after about one year and found semi-skilled/skilled employment as storekeeper and servant in Port Moresby.

[d]Three of these men elected to remain as casual laborers at Karu. None of them have returned to Ilakia and one married a New Ireland woman in 1972.

[e]One member of this group died of illness during his employment. As of October 1972, his relatives still had not received his earnings despite repeated inquiries at the Subdistrict Office in Okapa.

[f]These three men spent about nine months in jail after participating in a fight among co-workers 18 months after beginning work. This period of incarceration is not included as employment here. After his release from jail, one man left the job site and finally found work at the mines on Bougainville. He has since returned to Ilakia and has received his deferred earnings (prorated at 75 per cent of full pay).

[g]Five members of this group left their jobs after a fight at a neighboring plantation in which five Tauna Awa were killed. Three of the five are still employed in Port Moresby, one returned to Ilakia in August 1970 and has remained in the village, and the fifth man returned to Ilakia in 1971 and left shortly afterwards as a member of Migration Group No. 17. As of October 1972, none of these men had received any payment of deferred wages.

A$6350, payment was deferred until the completion of the contract and, in most cases, the return to Goroka. The deferred wages were paid in a lump sum ranging from A$50.75 to A$97.27 per man. The total of these amounts for all men who returned to the village within a few days of termination is a good estimate of the value of cash and commercial goods that have entered Ilakia as a result of agreement labor migration. As of October 1972, this addition to the village economy totalled about A$5800 over the previous decade.

Semi-Skilled/Skilled Casual Labor

Semi-skilled/skilled employment positions run the entire gamut of job opportunities from plantation foremen, longshoremen, and store clerks to carpenters, mechanics, and domestic servants. The government employs a large labor force under this category. Unlike the agreement labor, the casual day-laborer must arrange his own transportation to the job site, negotiate work arrangements with the employer, and often provide his own food, clothing, and housing. Therefore, to successfully enter the casual labor market, one needs not only considerable work experience or the required education, but must also have some financial backing and working knowledge of the job opportunities that exist. For villages without experience or education and with only very limited sources of locally earned cash, prior employment as unskilled casual and, more often, long-term agreement laborers is necessary. In fact, a large number of casual laborers in the work force of coastal urban areas were originally transported to the coast as agreement workers for the plantations. Once there, however, the contracts were broken and casual employment was sought in the towns. Many workers have successfully manipulated this opportunity, but it is a risky venture. If work is not readily available, savings are quickly consumed and the jobless soon find themselves without sufficient funds to either survive in the city or to return to the village.

Employment as semi-skilled/skilled casual labor is more difficult to obtain than the other forms of labor already discussed. Fewer positions are available and consequently competition for openings is more intense. The applicant must present himself at the work site and have sufficient command of the Neo-Melanesian language to convince the prospective employer that he either has the skills required for the job or is a good risk for rapid on-the-job training. Such requirements necessarily force individuals from isolated villages like Ilakia, who have no formal education and few marketable skills, to spend some time as unskilled casual and agreement laborers before attempting to break into the semi-skilled/skilled labor market.

In mid-1968, after completing one year of a two-year contract on a plantation near Port Moresby, a young Ilakian man walked off the job and caught a ride to Port Moresby. The first buisness day after his arrival in town, he was hired by Steamships Trading Company to work on their wharf. As such, he became the first Ilakian man to enter the semi-skilled labor force. After six months, he was hired as a domestic servant by a European household and was still employed in this position during 1972. Since leaving the village in February 1967, he has returned for only one visit in late 1970. He did marry an Ilakian woman at that time, but she remains in the village.

Another avenue for entering the semi-skilled/skilled casual labor market was extended to Ilakian agreement workers in May 1969. After completing a two-year contract on a New Ireland plantation, seven Ilakian men were invited by the manager to remain as casual workers. Three of the men elected to do so and are still employed there as drivers and work crew foremen. None of these men has returned to Ilakia since leaving in 1967 and one of them married a New Ireland woman in 1972.

A group of five Ilakian agreement workers walked off their jobs at a plantation near Port Moresby in December 1969 after a fatal fight among workers at a neighboring plantation.[6] Fearing the hostilities might spread to their work site, the Ilakians broke their contracts and fled to Port Moresby. Three of the men quickly found jobs on the wharf, another as a gardener and domestic servant, and the fifth finally found work on a construction project after remaining unemployed for about four months. Two of these men later returned to live in Ilakia, one after working a year on the wharf and the other after three months on the construction project. Of the three men who have remained in Port Moresby, one still works as a longshoreman, another as a domestic servant, and the third survives on part-time employment as a gardener and trade store clerk. Two of these men have returned to Ilakia for one visit each and one of them was married on that occasion.

The only other Ilakian man to participate in semi-skilled/skilled casual labor broke his work agreement on a New Britain plantation and made his way to Bougainville with three Auyana friends. They worked as day-laborers on several plantations near Rabaul and finally caught a boat to Kieta. There they were hired by a mining company and worked about six months before returning to their respective villages.

The ten Ilakian semi-skilled/skilled workers have accumulated a total of 26 man-years in such employment. All of these men were transported to the vicinity of their job sites as agreement laborers and seven of the ten actually broke their agreements to enter the semi-skilled/skilled labor market. It is impossible to estimate their total earnings, but, it is a safe approximation that no more than A$500 of these wages has entered the village economy. While the pay scales for these laborers are relatively high, ranging from about A$15-50 per month, infrequent contacts with the home village means that only a small proportion of this money enters the Ilakian economy.

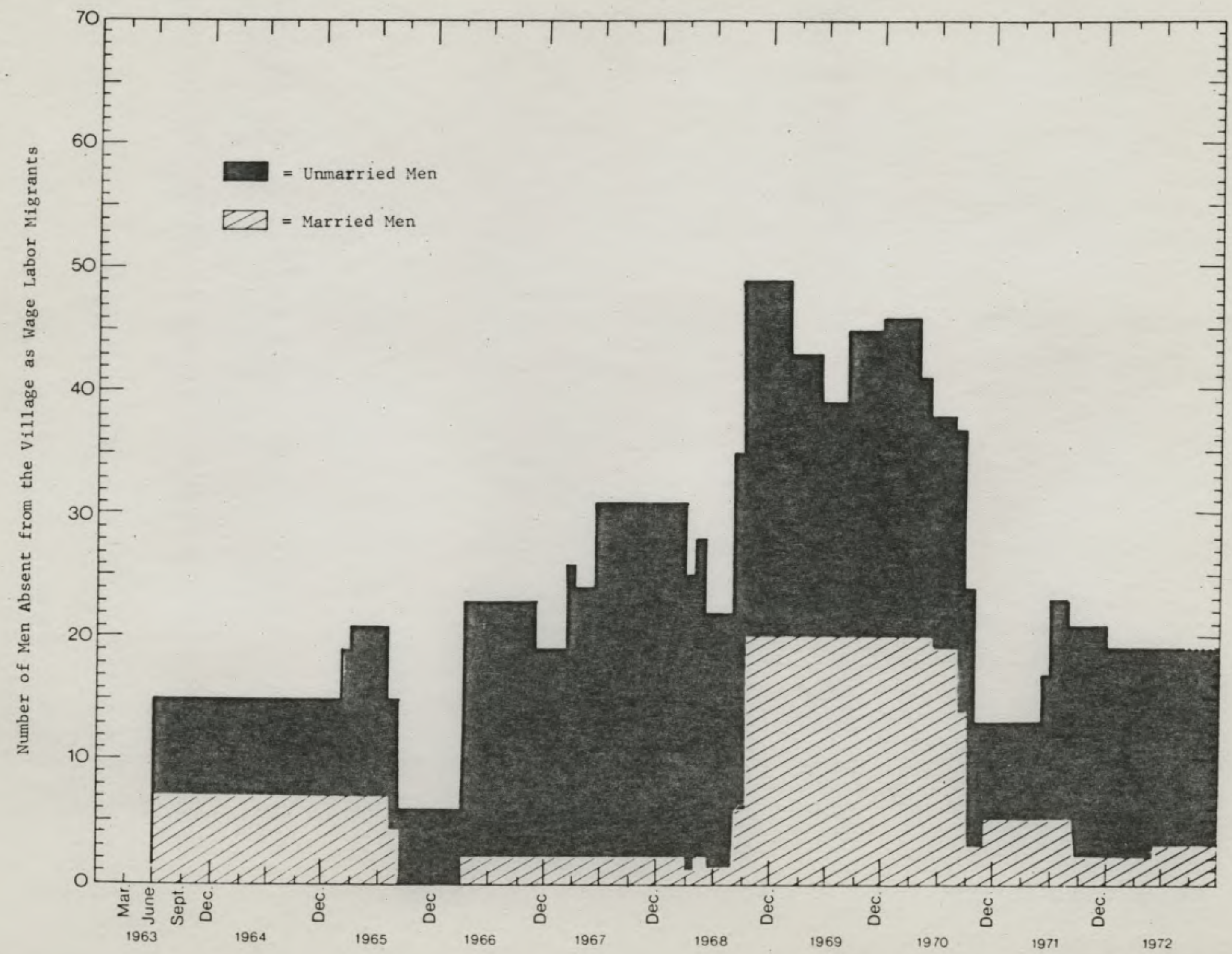
Dynamics of Ilakian Wage Labor Migration

It is clear from the discussion above that, in terms of demographic dislocations of the resident village labor force, agreement and semi-skilled/skilled employment are the two forms of wage labor migration that have had the greatest impact on the community of Ilakia. While many men have spent short periods of time away from the village as unskilled casual laborers, they have scheduled such work periods so as not to unduly interfere with their subsistence activities. Those individuals who have spent longer periods of time as unskilled casual workers are without exception young unmarried men whose participation in subsistence agriculture is very limited and, therefore, whose absence has only a small effect on village subsistence organization. For these reasons, unskilled casual employment is not included in the following analysis of wage labor migration dynamics.

The summary information given above on the extent of participation in labor migration allows a general understanding of the importance of these employment alternatives to Ilakians. However, a more detailed analysis of the sequence of population movements associated with labor migration during the decade from 1963 through 1972 is necessary to clarify the actual shifts in demography to which the village members had to adjust. The detailed records of the Highland Labour Scheme, summarized in Table 19, and cross-checked with informants' statements, make such an analysis possible.

The number of Ilakian men participating in migrant wage labor showed an overall gradual increase from the initial agreement labor group in June 1963 to early 1969 (See Figure 7). This was true for both married and unmarried men, although the younger unmarried men make up a much greater portion of the migrants. The peak period of migration extended from September 1968 to September 1970. During this two-year period, the percentage of the adult male population (15 years of age and over)

FIGURE 7: NUMBER OF MEN PARTICIPATING IN WAGE LABOR MIGRATION, ILAKIA VILLAGE.



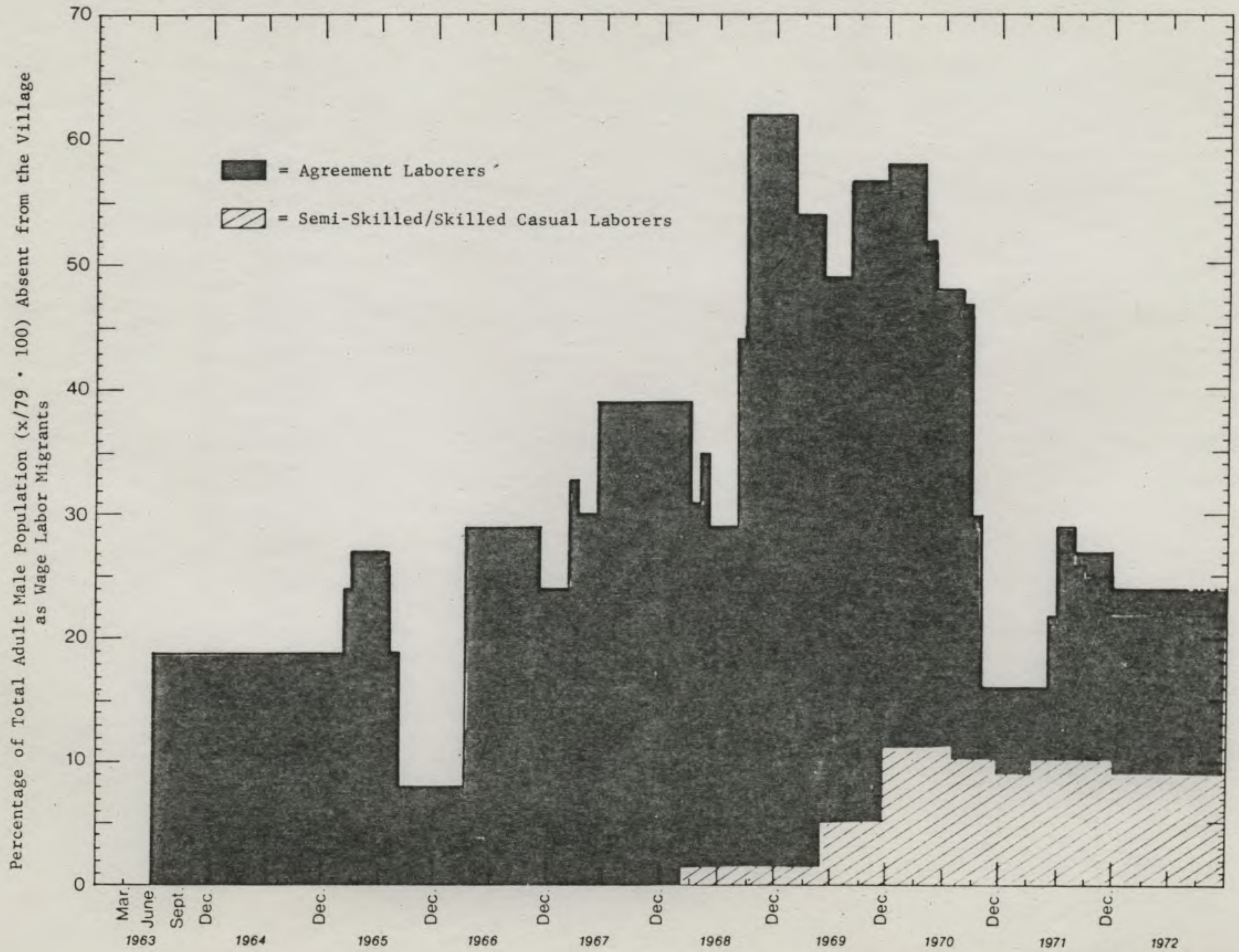
absent as labor migrants varied from 46 to 62 per cent (See Figure 8).[7] This situation was not deemed desirable by village elders and is still the subject of occasional discussions. In late 1970, migration declined dramatically and, by 1972, had decreased to 22 per cent of the adult male population. As overall labor migration was declining, participation by Ilakian men in semi-skilled/skilled casual labor was just commencing. By 1972, just under one-half of the migrants (8 of 18) were involved in this form of employment (See Figure 8).

It is interesting to note that the pattern of this empirical data from Ilakia Village closely conforms to the "agreement migrants" portion of a curve presented by Ward (1971:87) representing migration from a generalized "typical" rural area in Papua New Guinea. Since this appears to be a curve which commonly describes the incidence of at least agreement labor migration through time, the actual individual decisions made in Ilakia which resulted in such a distribution are of interest.

Labor Migration as a Markov Chain Process

The theory of Markov chains is one member of a larger category of mathematical theories concerned with describing stochastic processes (Kemeny and Snell 1960). Contraposed to deterministic models, which prescribe a

FIGURE 8: FREQUENCY OF PARTICIPATION IN WAGE LABOR MIGRATION, ILAKIA VILLAGE.



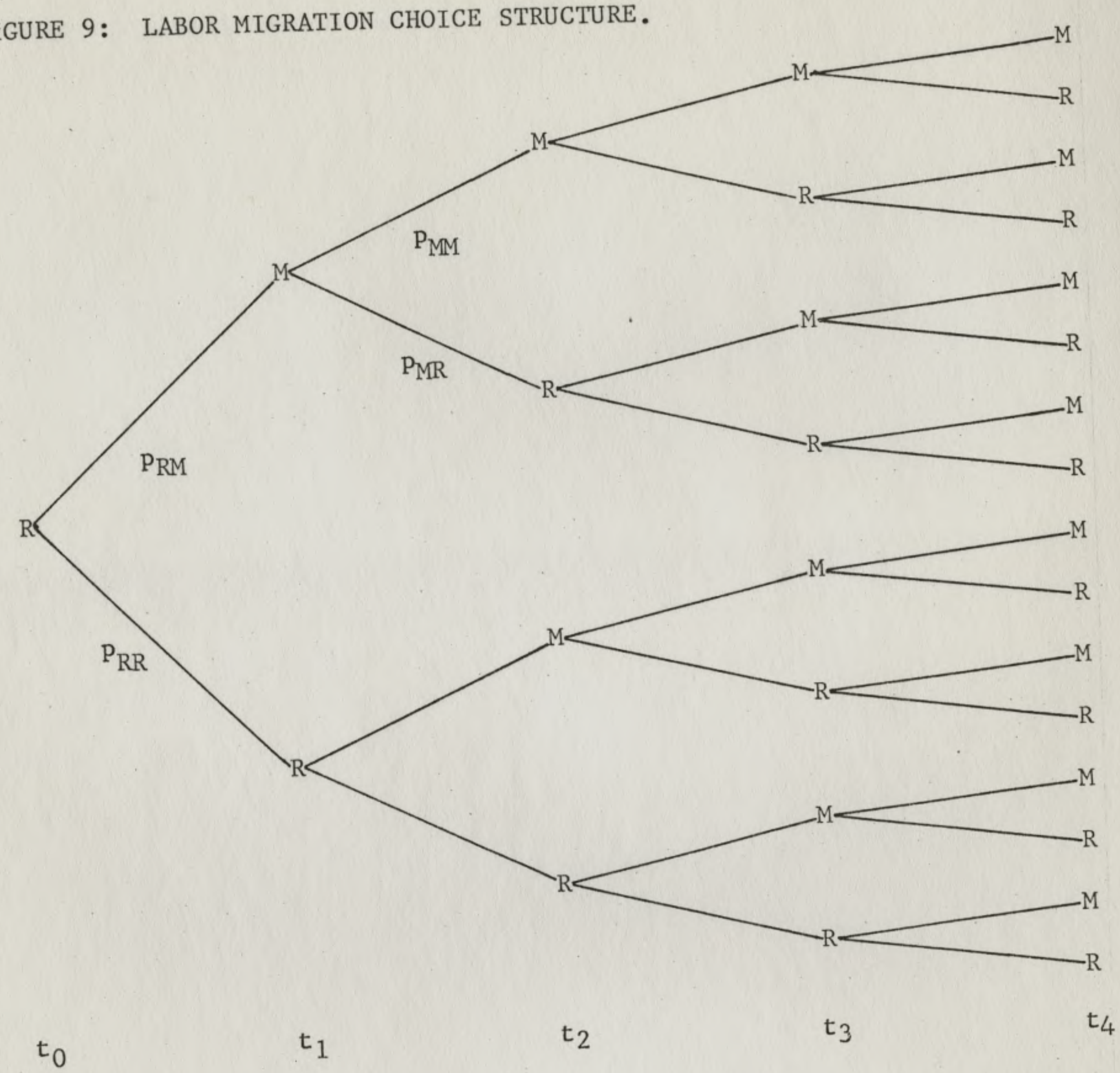
single "best" or "most rational" outcome to a given situation described by the model, stochastic or probabilistic models yield a whole distribution of predicted outcomes. That is, the stochastic model generates a series of statements concerning the probability that under given conditions, certain events will occur. It is this property of attempting to predict what events <u>will</u> occur, rather than what events <u>should</u> occur, that makes stochastic models a promising tool for studying human behavior (See Bartos 1967, Hoffman 1971, Rescher 1963).

In utilizing a Markov chain model to analyze agreement and semi-skilled/skilled labor migration by Ilakian men, the concern is with adequate description of past participation and confident prediction of future participation in wage earning activities which at present necessitate significant shifts in village demography. If this is possible, it would allow further predictions as to how the village residents are likely to reorganize their exploitation of land and labor resources to maintain a viable subsistence base. On the other hand, if the labor migration does not appear to be Markovian, the model will still have what Bartos calls "heuristic fertility"; that is, it suggests "new observations, experiments, and conceptualizations" (1967:324).

For labor migration, the set of all possible outcomes for a given time period $\underline{t}$ contains only two states--i.e. an individual must choose to either remain in the village (R) or to migrate (M). Therefore, state S_1=R and state S_2=M. Since the agreement labor contract requires a two-year commitment by each individual, it is assumed that each individual theoretically can make a decision to change his state only once during each two-year period. Therefore, two years is the natural time period for this model. The initial labor migration occurred in June 1963 which is designated t_0. Accordingly, t_1=1965, t_2=1967,t_3=1969, and t_4=1971. With this information, a branching diagram (See Figure 9) illustrates all of the logical possibilities of choices for Ilakian adult males from t_0 to t_4.

The primary concern of the Markovian model of labor migration being generated here is to describe the underlying dynamics of the labor migration process in Ilakia. For this reason, the numerical values to be used in the matrix of transition probabilities which define this Markov chain are not logically deduced from normative statements concerning the constraints which are likely to determine the migration frequencies. Rather, the actual empirically observed frequencies are used.

FIGURE 9: LABOR MIGRATION CHOICE STRUCTURE.



The calculation of transition probabilities based on empirical migration frequencies follows a standard procedure. At t_0, the origin date of the model, no Ilakian adult males had participated in labor migration, so all are considered to be in state S_1--i.e. remaining in the village (R). By t_1, however, all individuals had to decide to either not alter their state by remaining in the village (R $\rightarrow$ R), or to alter their state by migrating (R $\rightarrow$ M). It is then possible to count the number of individuals choosing each alternative at t_1--i.e. n_{RR} and n_{RM}--and express this outcome as a vector written (n_{RR}, n_{RM}). For this model, however, the proportion of individuals choosing each alternative is more important than their absolute numbers. By dividing both n_{RR} and n_{RM} by the total adult male population of Ilakia (N_T), the above vector is converted to the probability vector (p_{RR}, p_{RM}).

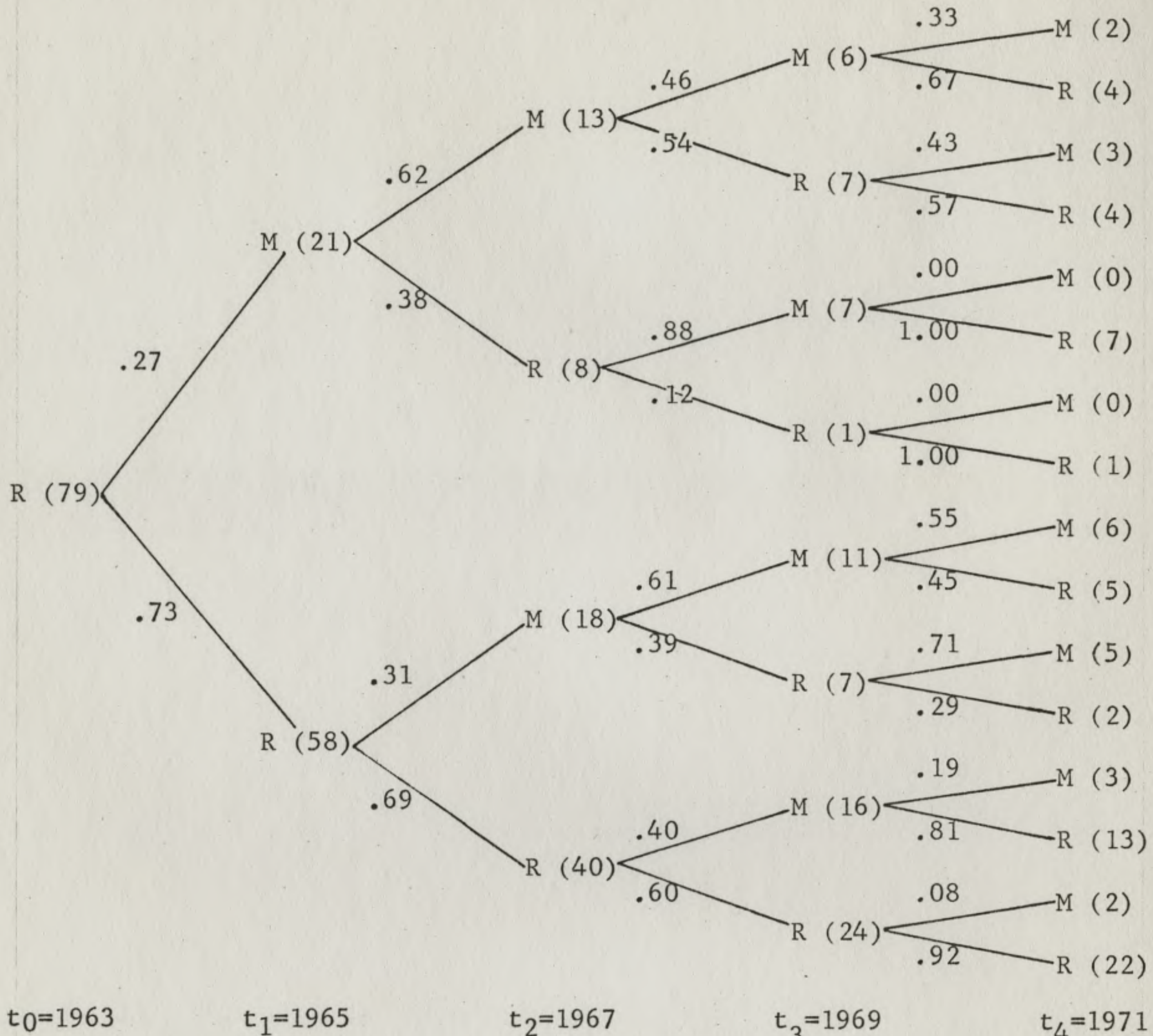
Four types of decisions are possible during any two-year time period subsequent to t_1: men who are residing in the village may decide to stay in the village or to enter the migrant labor force, and men who are presently migrants may decide to remain migrants or to return to the village.

The group of men residing in the village at the beginning of any time period are considered to be nonmigrants (R). During the two-year time period, however, each individual must decide whether to remain in the village--i.e. continue in state R--or to migrate--i.e. change to state M. The number of individuals making each choice is written as the vector (n_{RR}, n_{RM}). This can be converted to the probability vector (p_{RR}, p_{RM}) by dividing both n_{RR} and n_{RM} by the total number of individuals who began the time period as nonmigrants (N_R). It is obvious, then, that $p_{RR} + p_{RM} = 1.0$.

The decision frequencies of men who begin the time period as migrants (M) are calculated in an analogous fashion. Each individual must decide during the following two-year period whether to continue as a migrant (M) or return to the village and assume the state of nonmigrant (R). The number of individuals making each choice is written as the vector (n_{MM}, n_{MR}) and can be converted to the probability vector (p_{MM}, p_{MR}) by dividing both n_{MM} and n_{MR} by the total number of individuals who began the time period as migrants (N_M). By definition, $p_{MM} + p_{MR} = 1.0$.

The empirical data on the combined agreement and semi-skilled/skilled labor migration for Ilakian men is given in the branching diagram of Figure 10. The number of individuals following each possible path in the diagram is included in parentheses and the calculated

FIGURE 10: OBSERVED FREQUENCIES IN LABOR MIGRATION CHOICE STRUCTURE, ILAKIA VILLAGE



transition frequency for each branch is given as a decimal.

The summary of actual transition probabilities of Ilakian men for each of the four possible decisions during time periods t_1 to t_4 are as follows:

	t_1	t_2	t_3	t_4
p_{RR}	= 58/79 = .73	40/58=.69	25/48=.52	29/39=.74
p_{RM}	= 21/79 = .27	18/58=.31	23/48=.48	10/39=.26
p_{MR}	- - -	8/21=.38	14/31=.45	29/40=.72
p_{MM}	- - -	13/21=.62	17/31=.55	11/40=.28

Using the transition frequencies calculated above, a matrix of actual transition probabilities could be written for each of the time periods t_2, t_3, and t_4 that would accurately describe the migration behavior that took place. Each matrix would be of the following form:

$$P = \begin{array}{c c} & \begin{array}{cc} R & M \end{array} \\ \begin{array}{c} R \\ M \end{array} & \begin{bmatrix} p_{RR} & p_{RM} \\ p_{MR} & p_{MM} \end{bmatrix} \end{array}$$

The mathematical manipulation of such a set of matrices which would yield some understanding of the underlying patterns, however, is very complex. To render the mathematical computations more manageable, a simplifying assumption is imposed. The transition probabilities defining the Markov chain model are assumed to remain constant throughout all time periods. A single matrix of transition probabilities can then be used to describe the entire ongoing process and the model becomes, by definition, a finite Markov chain. To quote Bartos, "A finite Markov chain is a finite Markov process the transition probabilities of which do not depend on $\underline{t}$" (1967:29).

In terms of the labor migration model for Ilakia, a single matrix of transition probabilities must be selected to represent the decisions made by Ilakian men. Since the concern is with the dynamics of this process from the beginning of participation in agreement and semi-skilled/skilled wage labor migration, the initial probabilities for each decision alternative will be used. Selecting the transition probabilities calculated above for nonmigrants (R) in t_1 and for migrants (M) in t_2, the matrix of transition probabilities for the finite Markov chain model of wage labor migration in Ilakia is the following:

$$P = \begin{array}{c} \\ R \\ M \end{array} \begin{array}{c} \begin{array}{cc} R & M \end{array} \\ \begin{bmatrix} .73 & .27 \\ .38 & .62 \end{bmatrix} \end{array}$$

The model is based on the assumption that the percentage of Ilakian men choosing each possible decision alternative has remained the same during all subsequent time periods since the beginning of their participation in wage labor migration. The model actually presents a testable hypothesis. If the percentage of Ilakian men selecting each of the four alternatives has remained relatively constant since the commencement of labor migration, then the decision probabilities predicted by the model for all subsequent time periods should be nearly equal to the observed frequencies of the migration behavior. If this is shown not to be the case, it would indicate that the initial decision probabilities were not sustained during subsequent time periods and the causes for such shifts in migration strategies could be sought.

Now that a transition matrix representing the Ilakian labor migration process has been determined, it is possible to manipulate this matrix, using basic matrix algebra, to predict the proportion of adult males who will be in state R (nonmigrants) and state M (migrants) during any given time period. This is accomplished by employing a fundamental property of Markov chains: the probability of being in states R and M at time t+1 (expressed by the vector $p^{(t+1)}$) is equal to the probability of being in states R and M at time t (expressed by the vector $p^{(t)}$)

multiplied by the transition matrix P. This relationship may be written as the following equation:

$$p^{(t+1)} = p^{(t)}P$$

It should be noted from this equation that when a probability vector is multiplied by a transition matrix, the product is another probability vector. This procedure is defined as follows:

$$(a\ ,\ b)\begin{bmatrix} w & x \\ y & z \end{bmatrix} \underline{\underline{\text{def}}}\ (aw + by\ ,\ ax + bz)$$

By applying this manipulation to the data for Ilakia, the model generates predictions of what the migration frequencies should be in each time period if the assumptions of the model are correct. Given that the probability vector for t_1 is $p^{(1)} = (p_R\ ,\ p_M) = (.73\ ,\ .27)$, the expected probability vector for time period t_2 is calculated as follows:

$$\begin{aligned} p^{(2)} &= p^{(1)}P \\ &= (.73\ ,\ .27)\begin{bmatrix} .73 & .27 \\ .38 & .62 \end{bmatrix} \\ &= (.73\cdot.73+.27\cdot.38\ ,\ .73\cdot.27+.27\cdot.62) \\ &= (.63\ ,\ .37) \end{aligned}$$

The model, then, predicts that during time period t_2, 37 per cent of Ilakian adult males will choose to migrate and 63 per cent will choose to remain in the village.

The same procedure can be used to calculate expected migration frequencies for the remaining time periods t_3 and t_4:

$$p^{(3)} = (.63\ ,\ .37) \begin{bmatrix} .73 & .27 \\ .38 & .62 \end{bmatrix}$$

$$= (.60\ ,\ .40)$$

$$p^{(4)} = (.60\ ,\ .40) \begin{bmatrix} .73 & .27 \\ .38 & .62 \end{bmatrix}$$

$$= (.59\ ,\ .41)$$

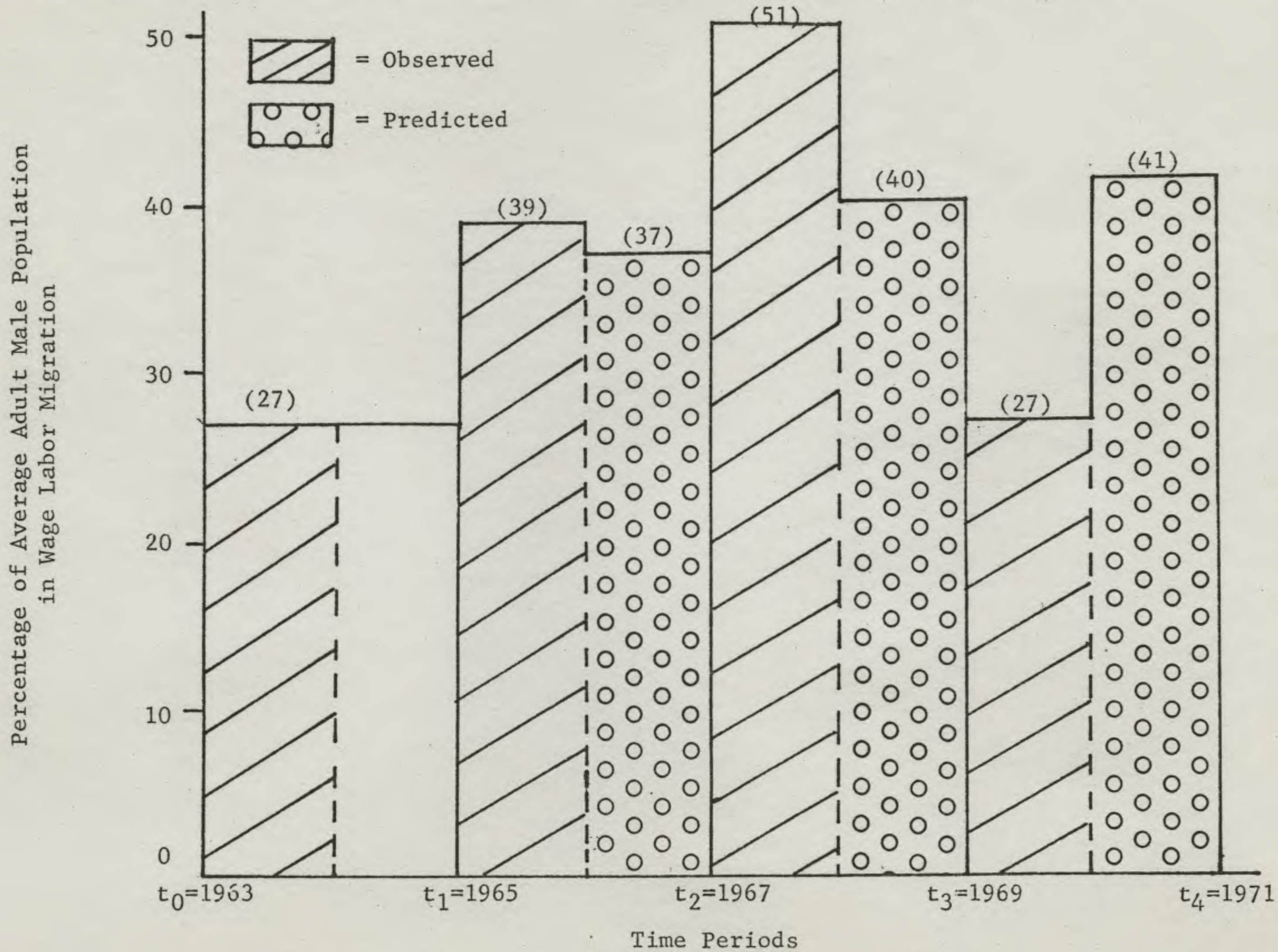
To judge the accuracy with which the Markov chain model predicts the behavior of Ilakian men, it is necessary to compare the expected migration frequencies computed above with the actual observed migration frequencies. The observed proportions of the total adult male population in state R (nonmigrant) and state M (migrant) at each time period t_1 through t_4 are calculated from the data presented in Figure 10. The comparison with the predicted values is as follows:

	Observed		Predicted	
	p_R	p_M	p_R	p_M
t_1	.73	.27	----	----
t_2	.61	.39	.63	.37
t_3	.49	.51	.60	.40
t_4	.73	.27	.59	.41

Figure 11 presents this data as an histogram comparing only the observed and predicted frequencies of individuals choosing the alternative of migration (M).

Comparison of the observed behavior of Ilakian adult males with the predicted behavior generated by the Markov chain model exhibits sizable disparities in time periods t_3 and t_4. While the predicted proportion of adult males expected to migrate gradually approaches a point of stabilization slightly greater than 41 per cent, the actual proportion of individuals known to have migrated exceeds expectations during t_2 and t_3, and then falls to 27 per cent in t_4, a value well below the predicted percentage. Clearly, the dynamics of wage labor migration in Ilakia do not appear to conform to the assumptions of the finite Markov chain model. More specifically, the initial frequencies of decisions to migrate or to remain in the village, on which the transition matrix of the model is based, do not remain constant over time.

FIGURE 11: OBSERVED AND PREDICTED FREQUENCIES OF LABOR MIGRATION, ILAKIA VILLAGE.



Although the finite Markov chain model does not predict labor migration frequencies for Ilakia beyond $t_1 = 1967$, it is not without merit. The purpose of such models is not to generate the vast intricacies of reality, but to simplify them. Without some assumptions as to the structure of an array of data selected from observable phenomena, the data are just numbers. Neither regularity nor randomness is apparent. The structuring of observations and, therefore, data, is done by making explicit assumptions and deriving testable hypotheses. If the variables under consideration are associated in a regular fashion with respect to the model, the expected outcomes will conform to a greater or lesser degree with the observed behavior--i.e. patterned regularities are explained. The degree of conformity will determine the predictive power of the model. A concomitant utility of models is the defining of ambiguity. Only by isolating the variation in observations that is explained by the model can the remaining variability--i.e. that which is ambiguous with respect to the model--become apparent. That is to say, randomness can only be defined in relation to regularity. If the variation appears random in relation to the model, the model adds nothing to an understanding of its distribution. However, if the variation exhibits a systematic deviation away from that expected by the model, a patterned regularity is defined. Noting patterned deviations from a model which is based on explicit assumptions leads to the generation of new hypotheses.[8]

The causes of the pattern of deviation of the observed migration behavior from the frequencies that would have occurred if the initial probabilities of decisions to migrate had been maintained during later time periods are undoubtedly complex. Several possible reasons come to mind. The deviation from the model in time periods t_2 and t_3 is due to the fact that a larger proportion of men decided to migrate as laborers during these two periods than had made the same decision during time period t_1. Considering the conditions prevailing during time t_1, this is not surprising. Living in a generally hostile sociocultural environment characterized by periods of intensive intervillage warfare, Ilakians cultivated a healthy fear of unknown people and places. Deciding to leave the home village for two years to reside in an unknown place, live and work with strangers, learn a different language, and eat unfamiliar foods was not a decision to be made lightly. It seems quite likely that the initial participation in labor migration had certain aspects of a trial run. When the original migrants returned unharmed with cash, valued commercial goods, and seductive stories of both drudgery and adventure, an increase in the proportion of men who would seriously consider this option seems probable. As for the decline during time period t_4, two general possibilities can be mentioned: 1) the resident village members were unwilling or unable to reorganize their subsistence activities to successfully adjust to the stresses caused by the absence of up to 62 per cent of the adult males; and 2) the conditions under which the migration decisions were made have changed significantly during the intervening time periods making such high migration frequencies impractical or unnecessary. It should be noted in this context that the overall frequency of migration in t_4 is identical to that in t_1, so the possibility of a cyclical fluctuation is present. An understanding of the pattern of labor migration in Ilakia, then, necessitates a consideration of its interrelationships with subsistence strategies and the changing sociocultural environment of the village.

Notes

1. Decker (1940), Mair (1970) and Reed (1943) give extensive historical accounts of indigenous labor practices and legal ordinances governing such employment in Papua New Guinea from the early colonial period.

2. All monetary units have been converted to the Australian dollar for the purposes of comparison. The approximate value in 1972 was A$0.95 ≈ US$1.00. The old Australian pound is assumed to equal A$2.

3. All information in this chapter concerning agreement labor migration by Ilakian men which includes specific details of dates of employment, sites of employment, and wages earned was taken from the actual contracts made available to me at the Highland Labour Scheme office in Goroka. I thank the staff members of the HLS for their kind assistance.

4. This young unmarried Ilakian man died on 7 October 1969 of an unidentified illness while employed at Londolovit Estate, Lahir Island.

5. This man slashed the throat of a co-worker with a penknife. According to other members of the same migration group, the Ilakian man had repulsed homosexual advances by the man he killed on several occasions prior to the killing. The Ilakian was tried in a court, found guilty, and sentenced to a four-year term in prison. If he served a full term, he should have been released about June 1972, but no one in Ilakia was certain of his whereabouts.

6. Five Ilakia workers broke their contracts in December 1969 after a fight at a neighboring plantation between workers from the Tari area and the Awa village of Tauna left five Tauna men and one Tari man dead (Papua New Guinea Post Courier 1970). Fearing the altercation might spread to their worksite, the Ilakian men fled to Port Moresby and sought work as semi-skilled casual laborers.

7. The number of Ilakian males 15 years of age and over has gradually increased from 76 in 1965 to 82 in 1971. Since age estimates and dates of death are extremely problematical, thereby making precise

estimates of increases in the adult male population for each time period very tenuous, the mean average adult male population for the entire span of time--i.e. 79 individuals--will be used in calculating all frequencies.

8. See Birdsell (1953) for an excellent demonstration of the potential value of utilizing models in this manner.

CHAPTER FIVE

CHANGING BEHAVIORAL STRATEGIES IN ILAKIA

The purposes of this chapter are to describe major alterations in the sociocultural environment of the community of Ilakia and to discuss the responses of members of this village to such external changes. Special emphasis will be given to adjustments in local behavioral strategies which facilitate exploitation of the wage labor market and, at the same time, allow continuation of a viable subsistence agriculture.

The necessity of engaging in both cash earning and food producing activities is perhaps obvious, although some authors have denied the importance of the former. An example is the economist E. K. Fisk who makes the following assertion in reference to Papua New Guinea.

> For these [indigenous] people . . .the greater and the most fundamental part of their economic activities takes place in the subsistence sector and without the use of money, whilst a smaller and less basic part takes place in the monetary sector (Fisk 1966:24).

Certainly economic transactions not including cash are more frequent and larger, but the assumption that those involving cash are, therefore, "less basic" leads the argument in a dangerous direction. Fisk concludes:

> As such, a money income is very acceptable and highly desired, but it can be dispensed with at any time without undue hardship either to the wage-earner or to his family (Fisk 1966:25).

This statement is questionable for 1966 and erroneous in the present. Indeed, it could only hold for the very few areas where the Pax Australiana and associated economic system have had little impact. Although most Papua New Guinean communities produce a major portion of the food they consume, they can no longer be considered self-sufficient units. The subsistence systems have shifted from reliance on a stone technology, practiced in the near past, to a steel technology which requires implements of commercial manufacture. The question of whether or not such groups could revert to the exclusive use of stone tools "without undue hardship" is academic and, inspite of the persistent predictions of world-wide ecological doom, will hopefully remain so.

The demand for cash is further increased by other concomitant changes of the modernization process, including annual taxation, use of commercial clothing, cooking pots, etc.

> The introduction of money and its related institutions in particular produces rapid and

far-reaching changes in traditional life. The erstwhile tribesman is faced with new demands on his customary production for subsistence, maintenance and ceremonial funds. Now subject to an alien elite, he is obliged to contribute taxes, which must be paid in cash rather than in goods or services, as soon as feasible. The cultivator is thus constrained to devote part of his resources of land and labour or both to produce some commodity for sale. In addition, after exposure to the technology and material goods of the dominant culture, he will inevitably acquire other needs for money . . . ." (Howlett 1973:259).

Although " . . . the generally subsistence and 'pre-industrial' nature of the economy [of Papua New Guinea] . . . makes it one of the least monetized in the world" (Jones 1971:39), cash is clearly an essential part of existence in the rural villages and can no longer be considered as providing a means of acquiring only luxury items. The amounts of cash actually required by subsistence producers, like the Ilakians, is relatively low, but, by the same token, the earning alternatives are few and the sums received are small.

The cultivation of coffee is the major source of locally earned income. In 1971-72, 58 Ilakian household production/consumption units had a total of 91 plots of coffee with 5900 trees (4360 mature and producing, 1540 planted, but not yet producing). The total land area occupied by coffee was 1.95 hectares (4.82 acres) which gives a tree density figure of 3026 trees/hectare (1224 trees/acre). This is considerably more dense than the

2204 trees/hectare recorded by Waddell (1972:60) for a sample of nine Raiapu Enga households, but compares very closely with the 3226 trees/hectare calculated from data reported by Hatanaka (1972:93, Table 9.2) and about 3000 trees/hectare estimated by Hide (1975) for the Sinasina peoples. On the basis of weighed samples, which range from slightly less than one point to 1.6 pounds of parchment coffee per tree, an average yield of 1.25 pounds (0.57 kg.) per tree is assumed. For the 4360 producing trees, the estimated total production is 5450 pounds (2477 kg.). This is slightly larger output than the 5296 pounds which would be derived using the 1100 pounds per acre (2716 pounds per hectare) estimated by Emmery (1970: 278).

The price paid for parchment coffee fluctuates widely from year to year (Shand 1966:87-88), but in 1972, Ilakians received about 10¢ per pound at the point of sale. This means that the total income from coffee production for Ilakians in 1972 was A$545. Emmery (1970:278) estimates, without giving details of the labor inputs, that it requires 137 man-days per acre per year (338 man-days per hectare per year) to tend, pick and process coffee for its sale as parchment. If this figure is applied to Ilakian coffee production, the cash returns are about A$0.83 per man-day. Hide (1975) estimates 2200 hours per hectare which, for the Ilakian case, yields A$0.13 per hour. Neither of these estimates includes the minimum five-hour walk over which the Ilakian coffee must be transported to the point of sale.

In May 1972, Ilakians attempted to reduce the labor inputs required for processing coffee by purchasing a hand-powered pulping machine, the first sizable capital investment made by a group of Ilakians. The stated reason for this venture, expressed by the three influential men who initiated the pooling of money, was that their mouths were sore from pulping coffee beans with their teeth. The purchase price of A$94 was contributed by 30 men and women. The machine was tied onto poles and carried to the village from Okapa. Instead of charging non-contributors a small fee for using the pulper to process their coffee, as noted by Brookfield (1968:108) among the Chimbu, only those individuals who helped pay for the machine are allowed access to it. While the machine sets idle a large portion of the time, the majority of Ilakians still pulp coffee with their teeth.

Another approach to assessing the earnings from coffee by Ilakians is in relation to the amount of taxes paid. As noted in Chapter One, taxes collected for 1972-73 totalled A$372. Seven men, however, were delinquent, which brings the total tax bill of that fiscal year to A$421. This means that 77 per cent of the total coffee earnings were required to pay the annual tax assessment. The actual impact of this figure, however, is misleading since the taxes are not paid by "average individuals" from "average earnings." If the income from one coffee tree is assumed to be 12.5¢, as estimated above, each adult male taxpayer would need 56 producing trees to cover his taxes. Of the 64 men assessed for taxes in 1972, only 32 (50 per cent) owned 56 or more mature coffee trees.

Other sources of cash for Ilakians are even more limited. The major craft speciality of Ilakians is the carving of high-quality black palm bows and arrows, a product for which they are well-known in the region. The demand, however, for bows and arrows among the Fore and Auyana peoples, who comprised the major portion of the traditional market, has seriously declined since pacification. Also, the trade in bird-of-paradise plumes, the most valued variety of which commands a price of A$10, has all but ceased. Traditionally, Ilakians were middlemen in the flow of feathers from the south, but since the opening of patrol posts in Wonenara and Menyamya during the 1960s, feathers and other goods flow to these more lucrative outlets.[1]

Another attempt at converting local resources to cash was tested in March 1972. Five Ilakian men and their wives carried peanuts to the local market outside Okapa and received a total of A$6 for their efforts. They considered the venture successful, even with the twenty-hour round-trip walk entailed, but no others attempted it. It seems unlikely that the marketing of peanuts will become a significant cash earning alternative for Ilakians in the near future. In fact, without the improvement of what Finney has called prerequisite "exogenous factors," especially "good communication and marketing facilities" (1968:407), exploitation of cash crops, including coffee, is likely to remain at a low level.[2]

The paucity of opportunities to earn money locally adds emphasis to the importance of wage labor migration in the present economy of Ilakia. Ward, however, reports that an eventual decline in agreement labor migration, like that which occurred in Ilakia, is characteristic of rural areas of Papua New Guinea, and cautiously suggests that the downturn ". . . may coincide with the increase in local sources of cash, usually from cash cropping" (1971:85). Salisbury and Salisbury (1972:64) assert that among the Siane only men with "low coffee earnings" migrate as laborers. In an attempt to test this relationship using simple linear regression, G. Harris found that for a sample of 37 villages in the Pangia Subdistrict of the Southern Highlands ". . . 70% of the difference in migration rates between the villages could be explained in terms of the number of coffee trees planted" (1972:132). He appropriately notes, however, that this is not a causal statement since both cash cropping and labor migration levels may be caused by other factors. For the Tauna Awa, Hayano (1973:310) found negative correlations between coffee earnings for a nineteen-month period in 1969-70 and both the "months away from the village" (r=-.531) and the "times away from the village" (r=-.343) as labor migrants for a sample of 25 returnees (no significance levels given). For Ilakia, the total number of coffee trees owned by 28 returnees shows no discernible relationship (r=.048) when correlated with the number of man-years spent in wage labor migration. It seems unlikely that income from coffee explains the rapid decline in wage labor migration by Ilakians. As M. Strathern suggests, based on her data from the Mount Hagen area, ". . . it would seem that there is no simple correlation between level of economic development at home and the exodus of migrants . . . ."(1972a:22).

The approach taken here is to consider specific interrelationships between labor migration and the local system of subsistence production. The manner in which subsistence agriculture systems and wage labor migration programs are organized present certain requirements which must be met if a given population is to receive the benefits of either. To receive the benefits of both requires careful consideration of the options available. The alternatives, from the position of the Ilakia Awa, in subsistence agriculture and wage labor migration and the frequencies of selection of various alternatives have been discussed in detail in Chapters Three and Four. It remains to consider the interrelationships between these two systems of production. Since casual unskilled labor migration by Ilakians is short-term (from two to ten weeks) and usually occurs when the demand for male labor in subsistence agriculture is minimal--i.e. during the months of June to August--its impact on subsistence production is negligible. For this reason, the following discussion only pertains to the long-term agreement and semi-skilled/skilled forms of labor migration.

For Ilakians, their ability to influence or control alternatives in agreement or semi-skilled/skilled labor programs is extremely limited. Essentially, potential workers may choose to either migrate or not migrate, and once employed, to either continue or quit. The phenomenon of agreement workers breaking their contracts and seeking employment in the towns can be viewed as an attempt to increase the number of options in a system which is, from their standpoint, rather inflexible.

The significant accomodations between the demands of subsistence production and wage labor migration must occur at the village level. The decisions are with respect to control of the number of men allowed to migrate out of the village and reallocation of the labor resources remaining in the village to conduct the subsistence activities. It is argued here that the necessity of obtaining cash and commercial goods, some of which are essential to the present system of cultivation, stimulate adult males to migrate, while the labor requirements of subsistence production limit the number of men who migrate at any given point in time.

The system of production in Ilakia, based on nine different garden types, a prescribed annual cycle of planting and harvesting, and a specific division of labor by sex, requires that all viable production units utilize both male and female labor during the subsistence cycle. Since households without adult females are extremely rare, the real importance of this requirement is that matrifocal households must enlist the aid of an adult male during at least one period of the annual cycle. Wage labor migration demands that adult males who participate leave the village for extended periods of time which precludes their labor contribution to the subsistence activities of their households. For married men, this means that another man who is residing in the village must assist the migrant's wife during the migrant's absence from the village since the household is then effectively matrifocal. The major impacts of wage labor migration on subsistence agriculture are, then, a shift toward greater reliance on female labor and an increase in the subsistence production responsibilities of resident adult males. It should be expected that the labor requirements of subsistence agriculture serve to limit the number of married men who will be allowed to migrate at any given time. By limiting the outflow of male labor, the increase in burden placed on women and resident males is controlled. The data on labor migration appear to confirm this.

The younger, unmarried adult males clearly predominate as participants in wage labor migration. Of the total of 103 labor contracts signed by Ilakains, 73 were entered by single men and only 30 by married men. If the temporal distribution of contracts by married men was relatively constant over the entire decade, it would be difficult to argue that any severe stress was placed on the men remaining in the village. This, however, is not the case.

From September 1968 to September 1970, when labor migration in Ilakia was at its peak, ranging from 46 to 62 per cent of the adult male population. From the total adult male population of Ilakia of 82 (51 married and 31 single), those under contract for some portion of this two-year period included 97 per cent (30 of 31) of the single adult males and 39 per cent (20 of 51) of the married adult males. Of all the contracts entered by married Ilakian men during the entire decade of migration, 67 per cent (20 of 30) were in effect. The 31 married adult males who remained in the village not only had to make gardens to meet the subsistence requirements of their own households, but also had to supply the male labor requirements for the households of 20 married migrants.

The high percentage of absent male heads of household would theoretically result in an average maximum workload increase of about 65 per cent (20 additional households for the 31 resident adult males) for all resident adult males. This estimate, of course, assumes that the wives of migrants continued to practice patrifocal subsistence strategies, thereby requiring the same amount of male labor inputs as when their husbands were present. While direct evidence is not available for the time period in question, the analyses of matrifocal household strategies in Chapter Three suggest that these households may have shifted to matrifocal strategies.

If all of the wives of migrants did shift to strictly matrifocal gardening strategies, thereby reducing the amount of male labor required, the average increase in labor inout of the resident adult males over the entire annual cycle would be considerably less than the theoretical amount.

One of the major characteristics of Ilakian subsistence agriculture, the periodic nature of intensive labor inputs, must be considered here. During preparation and planting activities of the Forest Yam-Taro and the Grassland Yam-Taro gardens, the length of a normal working day (actual time spent in the garden, but not including walking to and from the site) doubles from the average of 4-5 hours for other seasons of the year to 8-10 hours. In fact, most individuals with gardens more than a 45-minute walk from the village now build small grass huts at the garden site. These provide sleeping quarters for the gardeners and their families and allow them to spend three or four days each week without returning to the village, a practice not engaged in prior to 1969. Such periods of intensive gardening last from three to four weeks for the Forest Yam-Taro gardens and as much as four to six weeks for the Grassland Yam-Taro gardens. It is precisely during the period of intensive labor for the clearing and fencing of the Forest Yam-Taro gardens that all matrifocal households in Ilakia require auxiliary male labor. Therefore, the precise demographic situation during the months of September to November is most pertinent to this discussion.

As shown in Figure 7, 20 married men and 29 single men were migrants during September to November 1968. If the maximum possible estimate of 82 males 15 years of age and over (51 married, 31 single) is used, no more than 33 adult males (31 married, 2 single) were resident in Ilakia at that time. From September to November 1969, there were 20 married and 25 single migrants leaving no more than 37 adult males (31 married, 6 single) in the village. During both periods of interest, there would have been 20 matrifocal households in Ilakia due to absentee laborers. Based on an analysis of geneologies, the number of matrifocal households headed by widows during any portion of this two-year period could not have been less than 15.[3] If, under such unusual circumstances, it is assumed that the unmarried resident adult males worked as full adult male producers, the 33 men in 1968 and the 37 men in 1969 had to assist a minimum of 35 matrifocal households in addition to making gardens for their own households. If it is further assumed that the Forest Yam-Taro gardens of the matrifocal group averaged only one-half the area of those of the patrifocal group, it still means a minimum increase of approximately 50 per cent in the labor requirements of resident adult males during these two periods.

An increase of fifty per cent in the labor inputs of Ilakian men certainly is possible. An intensification of this magnitude, however, does not negate the hardship felt by the people subjected to the increased workload, even if it continues for only a relatively short period of time. It appears that this increased burden on the men left in Ilakia during this period of high labor migration rates led to the reduction of labor migration since 1970. During September of that year, only three married men were migrants and the number has not exceeded five to the present.

Being very knowledgeable agriculturalists, it is difficult to believe that Ilakians did not realize that such radical demographic change would have a severe impact on subsistence activities in the village. Possible reasons why they were willing to subject themselves to such undesirable circumstances deserve mention.

With the first news of white men with very sharp knives, a demand for commercial goods, especially steel tools, existed in Ilakia. The cost of such goods, however, was very high in terms of local wealth, and by 1964, steel tools were still in short supply (Newman 1964-65). The first group of migrant agreement laborers returned to Ilakia in mid-1965 with a sizable bundle of cash and goods, and a few months later, the increase in labor migration began which culminated in late 1968 and early 1969. The demand for a minimum inventory of commercial goods, especially steel tools, cooking pots, blankets, and some items of clothing, was so great that a severe strain on the subsistence base was risked. By 1972, 100 per cent of the households in Ilakia owned at least one bush knife and one blanket, 97 percent (71 of 73) owned at least one spade, and 92 per cent (67 of 73) owned at least one steel axe or hatchet. After obtaining these minimal acquisitions, migration was limited, especially among married men, thereby relieving the non-migrants from work requirements thought to be excessive.

The number of studies relating the demands of village subsistence production to the requirements of wage labor migration are very few. One by Watson (1958) however, provides sufficient detail to make at least a general comparison with the Ilakian case and complements the argument presented here.

Watson, in his study of the effects of labor migration on the Mambwe of Northern Rhodesia, asserts that 50 per cent of the active adult males can be absent from the village without causing any serious hardships for the remaining residents (1958:106-112). Since the general subsistence system and division of labor among the Mambwe and the Ilakians seem to be quite similar, the ability of the former and the apparent inability of the latter to cope with this rate of migration may be due only to the fact that the Mambwe have been labor migrants for 60 years, whereas the Ilakians are just competing their first decade. Still, there is one important difference in the organization of subsistence activities which deserves consideration. Among the Mambwe, the intensive labor input required at the time of garden preparation and planting is almost always supplied by large voluntary work groups whose members cooperatively assist each other in completing their individual plots. Indeed, Watson states that ". . . for the Mambwe, the work-party is the fundamental method of production" (1958:107). Most of the work is done by women and the only form of payment required is a reciprocal contribution of labor. Therefore, the wives of migrant laborers can facilitate the preparation and planting of their own gardens by regularly participating in a "work-party." Among the Ilakians, however, such large-scale cooperative gardening efforts are reserved only for individuals suffering from a temporary illness and for persons who have an abundance of mature gardens to make an immediate payment in raw foodstuffs for the special help. Wives of labor migrants, however, are not likely to have the means to meet the required payments-in-kind, so they must seek the assistance of an adult male outside their household. This difference in the organization of subsistence labor between the Mambwe and the Ilakians allows the former to sustain a relatively high level of participation in labor migration without jeopardizing subsistence production. At least for the present, the Ilakia Awa have chosen to limit labor migration and maintain their traditional system of labor organization.

Notes

1. Hughes (1971, 1973) presents an excellent study of pre-contact trading networks in the Central Highlands.

2. Sorenson (1972:370) discusses the relationship between the construction of jeep roads and "the coffee revolution" among the neighboring South Fore people.

3. In fact, on the basis of informants' estimates, usually in relation to the absolute chronology of labor migration, and the age of the youngest child, 19 is a more probable number of matrifocal households headed by widows and it could be as high as 25 for part of this period. For this analysis, however, the more conservative estimate is preferable.

CHAPTER SIX

CONCLUSION

The response of Ilakians to the stresses of labor migration has relevance to the theories of agricultural intensification and economic development. Initial participation in a modern economy as migrant wage laborers is a position that Ilakia shares with most of the other rural communities in the underdeveloped countries of the world. The removal of a large percentage of adult men from village economies for an extended period of time demands some adjustment in the local systems of subsistence production. The initial shift resulting from this demographic dislocation is an increase in the total amount of labor by women in subsistence food production. To know that female labor has always contributed a large portion to the total labor resource, as Boserup has amply demonstrated for ". . . systems of shifting cultivation where the plough is not used" (1970), is not enough. Shifts in the relative contributions of labor in relation to specific corps, cultivation techniques, divisions of labor, etc., must be viewed in the context of changing economic alternatives. The fact that this approach has not received adequate consideration is exemplified by the lack of appropriate terminology for dealing with it. When "division of labor" is dealt with, it concerns what might be more appropriately termed "division of tasks"--i.e. those labors which are exclusively performed by members of a specific subgroup in the population, such as members of one sex or a given age category. What is of concern here is not changes in the allocation of tasks among individuals in the group, but with changes in the percentage contribution of various subgroups to the total amount of labor expended in subsistence activities. It seems likely that, at least where labor migration is confined to a specific subgroup of the population, the initial intensification response of the village subsistence systems to this change is to shift the relative contributions of labor by subgroups within the population rather than to alter the traditional structure of task allocation. Close attention to the details of subsistence labor organization could quite probably increase the success rate of programs designed to improve the living conditions of subsistence agriculturalists.

Another point which demands brief consideration is the uncritical treatment given to the labor resource, especially the assumed "surplus" of this resource, by numerous scholars.

Sahlins, after examining a large quantity of data, both quantitative and anecdotal, for a wide range of subsistence agriculturalists, concludes:

> . . . from the point of view of the existing mode of production, a considerable proportion of the available labor-power is excess. And the system, having thus defined sufficiency, does not realize the surplus of which it is perfectly capable. . . . (1972:68, italicized in the original)

I submit that this is cause for neither alarm nor enlightenment. Precisely the same statement can undoubtedly be made for all productive systems in existence, including our own. Certainly the rationale for a forty-hour week comes from no higher authority than our particular mode of organization of labor for production.

Statements asserting the possibility of exploiting the assumed labor "surplus," however, are of more immediate concern. Fisk (1962, 1964, 1971), in outlining development strategies for Papua New Guinea, proposes a model in which a labor input:productive output production curve is specified for changing population size, assuming available land area is constant. A demand ceiling is assumed at some point above metabolic replacement plus an "acceptable" amount of leisure. Using this strict definition of demand, all labor available which if employed would result in production exceeding "demand" is considered surplus. As Waddell and Krinks have pointed out, this assumption is highly questionable for New Guinea societies where "power and prestige are dependent largely upon the control of goods and services" (1968:70). Fisk then makes the following evaluation:

> There is . . . a development potential concealed within the subsistence sector, in the form of a surplus of available labour and unused productive capacity of the tribal lands, which could be diverted to increase production if the necessary incentive were provided. . . . The subsistence group has surplus productive capacity over and above that required for the satisfaction of its subsistence requirements. This surplus capacity can be utilized for additional agricultural or other production without reducing the supply of subsistence foodstuffs, housing, clothing, etc. at the traditionally acceptable level of consumption" (1964: 156).

A development strategy which seeks to divert labor to increase production while at the same time maintaining the "traditionally acceptable level of consumption" is hardly acceptable. Needless to say, the political implications of such an approach are enormous. At best, the model is mildly ethnocentric, and, at worst, racist.

Fisk's model also assumes that ceremonial activities, including such specific examples as "ceremonial exchanges, bride prices and gambling games," are "non-economic" factors (1962:464, 1964:161, fnt.).

> The assumption that most nonagricultural activities of subject populations are also noneconomic and that the allocation of time among various activities is uninfluenced by economic considerations provides a convenient rationalization for compulsory labor and imposed cultivation, even for hut or poll taxes and exploitative wages (Jones 1969:282).

My concern here is not to criticize the theoretical elegance or logical coherence of the work by these authors, but to point out that they provide potentially harmful instruction to individuals actually responsible for designing development programs. It must be stressed that such assertions of the existence of surplus labor and the ease with which it can be exploited without causing harm to the individuals being exploited are based on the failure to recognize the most important feature of subsistence agriculture systems, without which they could not continue to exist: the flexibility of the organization of production. Without an adequate supply of labor, sometimes idle and sometimes fully employed (e.g. the shift from a 4-5 hour to an 8-10 hour working day in Ilakia during periods of intensive garden preparation and planting), the flexibility required to meet periodic demands or override aperiodic stresses is greatly diminished. As Clark and Haswell point out in their important work on subsistence agriculture systems:

> . . . the "surplus labour" is often more apparent than real, for the reason that the agricultural labour requirements vary greatly with the season. This is most marked in a strongly monsoonal climate, where a substantial labour surplus for nine months of the year may be followed by overwork and really acute labor shortage for three months. With less violence than in the monsoonal areas, the same may also be true of many other types of climate" (1964:114).

This, of course, is not only true for subsistence producers. Collins, in an analysis of nineteenth-century European agriculture states:

> . . . the real problems . . . were far from exclusively those concerned with under-employment and low labour productivity. An important, and in the final analysis perhaps the chief limiting factor in increased farm output was the capacity of the farm labour force at times of work bottlenecks. Even in the most lowly productive agricultures and under conditions of chronic unemployment the highly seasonal nature of crop production can easily create serious labour shortages at peak activity periods of the farming year (1969:61).

In short, to deprive agricultural systems of seasonal access to needed labor is to destroy their ability to survive. Models which ignore this fact are detrimental to the stated goal of understanding and manipulating the process of economic development.

> The facile usage of terms and concepts such as unemployment and underemployment with reference to those parts of the

> population which could theoretically be regarded as potential workforce contributes little to better understanding of the problems" (Beltz 1971:55).

This study has attempted to describe and analyze a small amount of the complexity and flexibility present in the system of subsistence agricultural production employed by the people of one Highland village, the Ilakia Awa. Although the options available to Ilakia household production/consumption units are many, it is shown that the selection of alternatives conforms to general patterns defined by the resources available to and the consumption demands of these units. Of special importance to maintaining viable subsistence production systems is the availability and organization of adequate labor. If disregarded, this fact will sabotage development programs and will eventually cause the destruction of village-level systems. It is hoped that detailed investigations of local organizations of production will increase our knowledge of the requirements and potentialities of subsistence agriculture.

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APPENDIX

TUBER PRODUCTION OUTPUT ESTIMATES

Numerous variables combine to determine the actual production output of crops on specific plots of land--e.g. slope, soil type, precipitation, drainage, crop association, plant density, predation, etc. Therefore, estimates of tuber production output factors are necessarily tentative approximations. Nevertheless, some attempt to provide general comparative approximations for the various types of Ilakian gardens is necessary for this study. While gardens of a specific type exhibit remarkable homogeneity with respect to crop associations and plant densities, the differences between the several types are considerable.

All tuber output factors are based on the estimated weight of raw tubers in the following condition: yams are unpeeled and corrected for the weighed estimate of the portion required to replant the crop--i.e. 34 per cent of the gross weight; taro is unpeeled and minus the "head," or sett, that is cut from the top of the tuber and used for replanting; and sweet potatoes are unpeeled and corrected for the average weighed amount considered to be too small for normal human consumption--i.e. 20 percent of the gross weight.

Estimates of the tuber output factors for the seven tuber-producing garden types, some based on weighed samples and some on comparative estimates, are given below. It must be emphasized that these output factors do _not_ represent the _total_ food crop production or the _total_ caloric output of any garden type since _only_ the major staple tubers--i.e. yams, taro, and sweet potatoes--are included.

Tuber Output Factors Based on Measured Outputs

The following two methods of measurement were used:

1) Direct--This method of measuring tuber output was used on those occasions when all tubers within a given area were harvested at the same time. Care was taken to include all tubers from the specified area and to exclude occasional tubers harvested by the owner at the same time from other areas of the garden. The total weight of the tubers was divided by the measured area harvested to give the tuber output.

2) Indirect--Since harvesting is usually done by selecting a few tubers from a large area of the garden,

the conditions required to obtain direct output measurements occur infrequently. Therefore, a method of indirect measurement also was employed. Random samples of harvested taro and yam tubers were weighed and divided by the number of tubers in the respective samples to estimate the average weight of single tubers. For taro, the average tuber weight was 0.47 kg. (45.6 kg./98 tubers). For yams, the average gross tuber weight of 1.06 kg. (82.9 kg./78 tubers) was corrected for the average weight of yam sections used for replanting (7.2 kg./20 sections = 0.36 kg./section or 34 per cent of the gross weight) to yield an average net tuber weight of 0.70 kg. The number of both yams and taro planted in randomly selected plots of 100 square feet (0.00093 ha.) were counted and multiplied by the respective average tuber weights. The total weight of both yams and taro was divided by area of the selected plot to yield the estimated output.

The method of measurement used for each sample is indicated below.

<u>Forest Yam-Taro</u> (yams + taro) . . . . . . 4492 kg./ha.

This output factor is the average of the following four samples:

1) 60.8 kg./.0144 ha. = 4222 kg./ha. (direct)

2) 4.4 kg./.00093 ha. = 4731 kg./ha (indirect)

3) 4.2 kg./.00093 ha. = 4540 kg./ha. (indirect)

4) 9.85 kg./.0022 ha. = 4474 kg./ha. (direct)

17,967 $\bar{x}$ = 4492 kg./ha.

Grassland Yam-Taro (yams + taro) . . . . 16,950 kg./ha.

This output factor is the average of the following four samples:

1) 16.3 kg./.00093 ha. = 17,527 kg./ha. (indirect)

2) 19.2 kg./.00093 ha. = 20,645 kg./ha. (indirect)

3) 254.5 kg./.0194 ha. = 13,119 kg./ha. (direct)

4) 468.9 kg./.0284 ha. = 16,511 kg./ha. (direct)

67,802 $\bar{x}$ = 16,950 kg./ha.

Forest Sweet Potato (sweet potatoes). . . . . 17,080 kg./ha.

This output factor is the average of two estimates:

1) One sample of one square meter yielded 5 lbs. (2.27 kg.) which equals 22,700 kg./ha. If 80 per cent of the gross weight is considered fit for human consumption, the estimate equals 18,160 kg./ha.

2) A. J. Kimber (1973), an agronomist with the Department of Agriculture, Stock and Fisheries, At Aiyura, E.H.D., estimates that the yield of sweet potatoes from gardens in an altitude range of 1500-2000 m. is about 20,000 kg./ha. If 80 percent is assumed fit for human

consumption, the yield is 16,000 kg./ha.

This tuber output factor is similar in magnitude to the 18,447 kg./ha. measured by Clarke (1973) for a plot at an altitude of 1650 m. (5360') in the Mount Hagen area. Clarke's estimate is not included here, however, because the method of cultivation is described only as being "traditional."

Irrigated Grassland Taro (taro only) . . . . 13,411 kg./ha.

This output factor is the average of the following two samples:

1) 25.4 kg./.0016 ha. = 15,875 kg./ha. (direct)

2) 246.3 kg./.0225 ha. = 10,947 kg./ha. (direct)

26,822 $\bar{x}$ = 13,411 kg./ha.

Tuber Output Factors Based on Comparative Estimates

Tilled Grassland Sweet Potato + Peanut (sweet potatoes) . . . . 8450 kg./ha.

The output of this garden type is assumed on the basis of observation and informants' statements to be one-half the amount of Forest Sweet Potato gardens. This is considered a reasonable estimate since the average tuber size in this type of garden is smaller than in the Forest Sweet Potato due to the prior cropping of yams and taro on the same plots. The tuber size is said to further decrease with each successive planting of sweet potatoes.

Untilled Grassland Sweet Potato (sweet potatoes) . . . . 11,444 kg./ha.

The output of this garden type is assumed to be two-thirds the amount of Forest Sweet Potato gardens. Informants stated that the tubers were never as large in these grassland gardens as in the forest type and attributed this to poorer soils and less frequent weeding. All informants agreed, however, that they are more productive than the Tilled Grassland Sweet Potato gardens.

Irrigated Forest Taro (taro only) . . . . 15,000 kg./ha.

Informants stated that the size of tubers produced in these gardens is the same as in the Irrigated Grassland Taro gardens. Plant density measurements show that the taro is slightly more dense in the forest type since the crop association used includes fewer different plants. This output factor, then, is estimated as slightly larger than that for the Irrigated Grassland Taro gardens.