Changing Migration Patterns of the Huli in the Papua New Guinea Highlands

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A Genealogical Demographic Analysis

On the basis of interviews in 2 Huli-speaking villages in the Papua New Guinea Highlands, genealogical charts for 1678 persons, alive or dead, representing 5 generations, were reconstructed to investigate the change in intrapopulation migration patterns in response to modernization and environmental degradation in their habitats. Migration flows from less modernized and thinly populated areas to more modernized and densely populated areas predominated among the older generations, whereas flows in the opposite direction prevailed among the younger generations. This observation is attributable to the disparities in modernization that have increased since the establishment of an administrative center and to the resulting shortage of garden areas around the overpopulated center, respectively. A gold rush in the end of the 1980s may also have been a cause for the migration flow toward the northern, less modernized area.

Keywords: *Migration; demographic change; modernization; environmental degradation; Papua New Guinea Highlands.*

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Introduction

In the Tari basin in the Papua New Guinea Highlands, where the Huli-speaking people live, food security has been a major concern for several decades. Population density has reached 400 persons/km^2 around the administrative center, and soil erosion and environmental degradation have been observed in the surrounding mountainous areas at higher altitudes (Wood 1985). A previous study by the authors of the present article revealed that the ability to cope with climatic perturbation has decreased in mountainous areas over time, whereas intergroup disputes regarding land tenure inhibited the expansion of garden areas in the swamp (Umezaki et al 1999, 2000).

In 1952 the airstrip and an administrative station were constructed in the central part of the Tari basin. Since then, intrabasin disparities in the level of modernization have increased. In the Huli society an individual belongs to several communities and often moves from one community to another during his or her lifetime (Glasse 1968). Migration may thus be one of the important factors that govern the spatial distribution of the population. The Huli people claim that migrations to the central part of the basin have become prevalent since the establishment of the administrative and commercial center in Tari, which has led to overpopulation in the area around the center. They also maintain that the resulting overpopulation prevents the younger generations from having gardens in the villages around the Tari airstrip, and they are now seeking gardens in mountainous areas at higher altitudes. Quantitative investigation of such migration patterns is indispensable to ensure sustainability of the Tari basin in future.

In practice, however, reconstruction of past migration patterns is difficult. Written records for vital statistics before 1980 are not available, and the people do not remember the years in which events occurred. The only available data for the past are the genealogical relationships reported by the people. The present study used genealogical charts to reconstruct past migration patterns and changes in these patterns over time. Medium-term (between 1980 and 1995) and short-term (between 1993 and 1995) migration patterns were also investigated to enhance understanding of migration in the Tari basin.

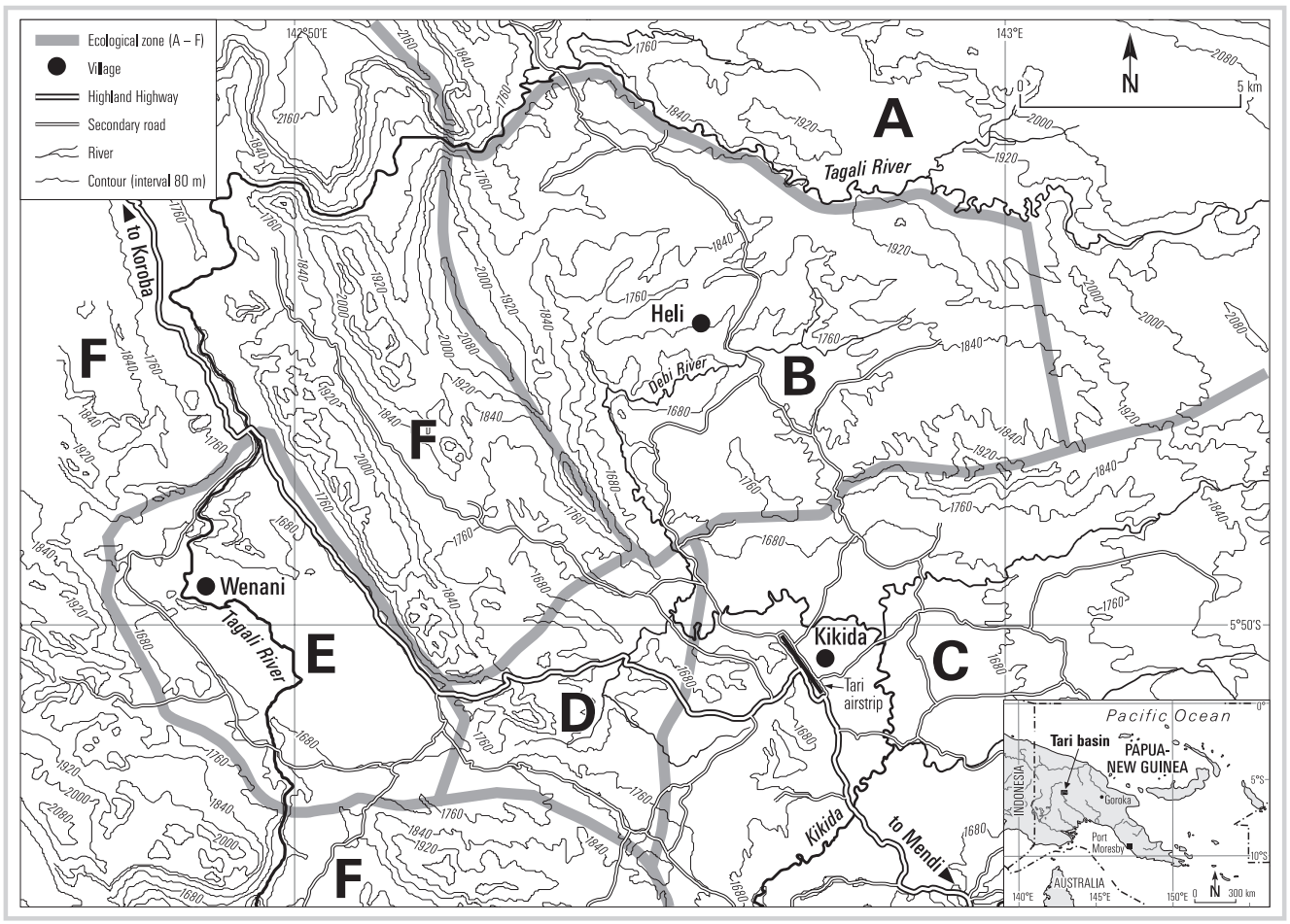
The study area

The Huli land ownership system

The Tari basin is located at an altitude of 1600–2000 m above sea level in the Papua New Guinea Highlands. The population growth rate in recent years has exceeded 2% annually. The population density is one of the highest in the country. There were 65,000 Huli-speaking people in the 1980s (Foley 1986). Inhabitants of the basin heavily depend on cultivation of sweet potatoes in mounded fields using the most intensified agricultural techniques in Papua New Guinea (Bourke 1989).

Huli land has been divided into more than 200 portions, each of which is owned by a descent group known as *hameigini* (Wood 1985; Allen 1995). The *hameigini* owns "territory in common, though only a portion of its members lives or gardens there" (Glasse 1968). Thus, a nonresident member of a *hameigini* can be a resident member of another *hameigini*. Residence within the territory is not crucial for membership in the descent group that owns it, although nonresidents have to satisfy the same conditions as residents and support the group by fighting, contributing pigs for compensation, and participating in rituals (Allen 1995). The corollary is that an individual can simultaneously belong to several *hameiginis*. Actually, people may have more than 1 residence, with the second commonly located in the territories of other *hameiginis*. Even when an individual has only 1 residence, he or she usually has gardens in several *hameiginis,* which are

FIGURE 1 Environmental zones used to discuss migration in the Tari basin. Zones C, D, and E are more fertile than zones B, A, and F; zone C with the town of Tari in its center has been developed since 1952, whereas zones A and F have remained undeveloped. Population density was the highest in zone C, intermediate in zones B, D, and E, and the lowest in zones A and F. Mt Kare is located about 30 km north of the study area. (Map by author and Andreas Brodbeck)



potential future places of residence.

For Huli individuals, marriage is probably the event that is most likely to lead to a change in their place of residence. The couple can choose their place of residence from several *hameiginis* to which the bride and groom belong. Either the bride or the groom shifts their residence. Movement may also be triggered by tribal fighting and climatic perturbation: people escape from or reinforce locations where tribal fighting takes place and evacuate areas affected by famine. People also move for no apparent reason. We assumed that the decision to migrate reflected people's evaluation of their places of origin and potential destination at the time of movement.

Environmental zonation

Wood (1985) divided the Tari basin into 12 natural ecological units on the basis of landscape characteristics (geology, altitude, slope, soil type, and vegetation). In corresponding fashion, the Tari basin was divided into 6 zones in the present study on the basis of population density, which was associated with environmental conditions and the degree of modernization (Figure 1).

The lands in the flat basin (ie, zones C and D) and swamp (ie, zone E) are more fertile than those in mountainous grassland (ie, zone B) and mountainous forest (ie, zones A and F). Zone C—with the town of Tari at its center—has developed markedly since the establishment of the administrative center in 1952, whereas zones A and F have remained undeveloped. Population density was the highest (over 100/km^2) in zone C, intermediate (50–100/km^2) in zones B, D, and E, and lowest (less than 50/km^2) in zones A and F. Zones A and B were divided by the Tagali River, whereas zones B and C were divided by the Hawa ridge. Zone E refers to the flat swamp, whereas zone F is the surrounding mountain around zone E. Zones A, B, and F are divided by a sharp limestone ridge. The boundary between zones C and D was defined arbitrarily so as to reflect the difference in population density. Two *hameiginis,* Wenani located in zone E and Heli located in zone B, were selected for the study. Detailed characteristics

TABLE 1 Wenani and Heli populations, by generation and sex, and proportion of individuals alive in each category. The sex of 21 individuals in Wenani and 28 in Heli could not be identified; they were excluded from the table.

	Number						Proportion of individuals alive in total population (%)					
	Wenani			Heli			Wenani			Heli		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
G1	12	14	26	14	14	28	8	7	8	7	7	7
G2	46	52	98	36	45	81	28	44	37	19	33	27
G3	161	151	312	91	89	180	81	94	87	81	83	82
G4	236	204	440	182	155	337	90	94	92	92	94	93
G5	20	25	45	41	39	80	95	100	98	98	97	98
Total	475	446	921	364	342	706	79	86	82	79	80	80

of the 2 communities have been described elsewhere (Umezaki et al 1999, 2000).

For the people who were affiliated with several *hameiginis* located in zones A and B, it was possible to earn money by digging gold on Mount Kare, the giant mining field that was operating at the end of the 1980s but dwindled by the beginning of the 1990s (Clark 1990; Vail 1995). People from the Heli *hameigini* used this opportunity at the end of the 1980s, and nonresident members of the Heli area may have moved to the north in search of gold. By contrast, in Wenani, few people had acknowledged genealogical ties with the *hameiginis* in zones A or B, and none were influenced by Mount Kare mining.

Methodology

Data were collected during fieldwork in August 1993–November 1993, September 1994–February 1995, and July 1998–September 1998. Migration patterns were investigated at 3 levels: short term, medium term, and long term.

For the short-term investigation, monthly movements for all households—22 in Heli and 43 in Wenani—were monitored for a period of 18 months, from August 1993 to January 1995.

For the medium-term investigation, a demographic database in the Papua New Guinea Institute of Medical Research that recorded vital events between 1978 and 1997 (Lehmann et al 1997) was consulted to investigate demographic changes, particularly migration to and from Heli and Wenani between 1980 and 1995. In addition, aerial photographs taken in 1978 (Mapmakers color aerial photographs, scale 1:9500, Tari area, runs 10 and 11, November 1978; available at National Mapping Bureau, Port Moresby, Papua New Guinea) were used to identify the houses in Heli or Wenani at the time. The names of people who resided in the houses in 1978 and vital events since then were recorded. The construction of a highway from the provincial capital of Mendi to Tari in 1978—a well-remembered event—helped people to remember who inhabited the area at that time. A database containing demographic and interview data was cross-checked to compile the final list of inhabitants in Heli and Wenani in 1980 and vital events between 1980 and 1995. For comparison, the population in 1995 was defined as all people who had houses in Heli and Wenani in November 1995, except those who did not use their houses for more than 6 months.

Finally, for the long-term investigation of migration, genealogical charts were reconstructed. All married persons under 60 years of age who had gardens in either of the 2 *hameiginis* in 1995 (including those who did not inhabit them) were identified and categorized as members of generation 3 (hereafter referred to as G3). In cases where there were more than 2 such persons in 1 family, the youngest was defined as G3. The second, full series of genealogical charts involving 2 generations previous to G3 individuals were reconstructed. The ascendants who were grandparents and parents of the members of G3 were categorized as G1 and G2, respectively, whereas children and grandchildren of the members of G3 were categorized as G4 and G5. All siblings of parents and their descendants were recorded and categorized appropriately (from G2 to G5). The individuals listed in our genealogical charts are potential members of each *hameigini*.

The genealogical charts contain 942 individuals in Wenani and 734 in Heli (Table 1); the individuals whose sex could not be identified (mostly newborn babies who lived outside the Tari basin) numbered 21 in Wenani and 28 in Heli. Of the remaining 921 and 706 individuals in Wenani and Heli, 82.3% and 79.7%, respectively, were alive in 1995, whereas the percentages were lower in the older generations. When an individual's places of birth and death or residence belonged to different zones in Figure 1, he or she was defined as having migrated.

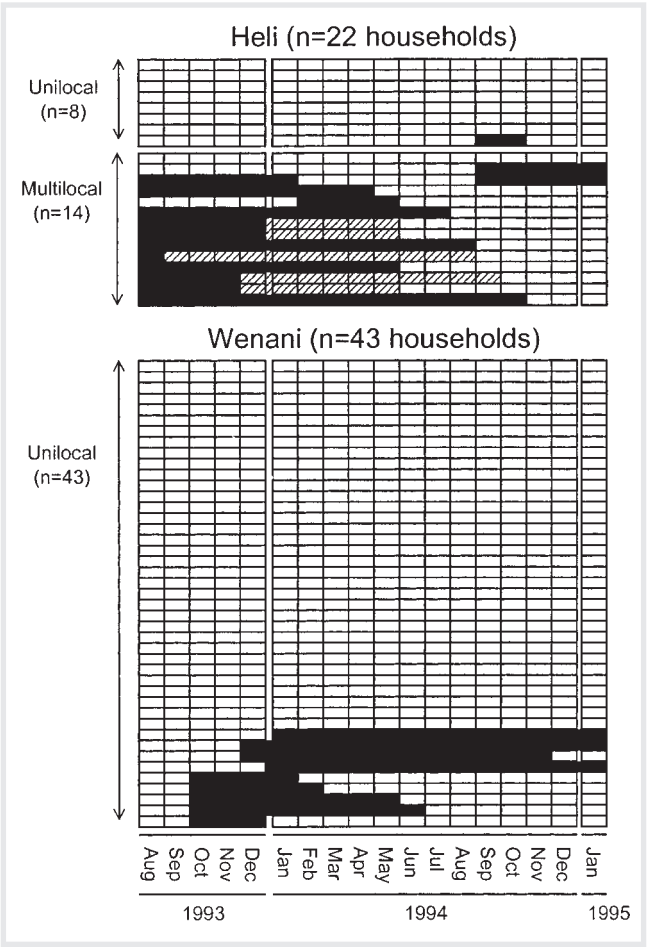


FIGURE 2 Monthly movements of all households in Heli (n = 22) and Wenani (n = 43) during the 18 months from August 1993 to January 1995. Each line represents 1 household that had a house in Heli or Wenani during the observation period. □, absent from the *hameigini;* ■, present in the *hameigini;* ▨, going to and fro. Of 22 households in Heli, 14 had houses outside the Heli territory (multilocal residence), whereas all households in Wenani had only 1 house.

Results

Figure 2 shows household movements during the 18-month period between 1993 and 1995. Of the 22 households in Heli, 8 had only 1 house (referred to here as a "unilocal household"), whereas 14 had 1 house in Heli and another outside (designated as a "multilocal household"). During the period between August 1993 and January 1995, 13 of the 14 multilocal households actually moved from the house in Heli to other houses and vice versa. Five households had 5–12 months of back-and-forth periods, during which they used the houses and gardens in Heli and another *hameigini* simultaneously. In Wenani, by contrast, all households were unilocal. But 6 households visited and remained in the houses of relatives in the other *hameiginis* for several months. They did so to escape from troubles such as disputes over land tenure, suspicion of stealing garden crops or domesticated animals, or quarrels with neighbors. The people reported that the number of such troubles increased as the population density increased; in 1995, rights to cultivation of 63% of the swamp area (potentially arable land) were disputed (Umezaki et al 2000).

Table 2 shows the demographic change in Heli and Wenani between 1980 and 1995. Population increased in both communities: from 57 to 81 in Heli and from 103 to 154 in Wenani; the annual rates of population increase were 2.1% and 2.5%, respectively. Of the increases between 1980 and 1995, 24 in Heli and 51 in Wenani, 46% and 80%, respectively, were due to natural increase. In other words, 54% of the population increase in Heli and 20% in Wenani can be explained by migrations from other communities. Total movements (the sum of in-migrations and out-migrations) were 89 in Heli and 92 in Wenani, despite the fact that the population of Wenani was almost double that of Heli. Migrations were more frequent in Heli than in Wenani. Of the total population in Heli (81) and Wenani (154) in 1995, only 13% of those in the former and 35% of those in the latter also were present in 1980. In summary, the demographic data between 1980 and 1995 indicate that (1) the population increased rapidly in both communities, and (2) frequent migrations are the most important determinant of population size, especially in Heli.

Table 3 shows the places of birth, residence, and death for all the individuals listed in the genealogical charts. For the Wenani people these places were mostly limited to 3 zones in the Tari basin (C, E, and F), especially zone E, where 74% of the Wenani people were born, 64% lived, and 77% died; few individuals used zones A, B, and D during their lifetimes. Of 768 individuals in Wenani whose places of residence were known, 129 lived outside the Tari basin (mostly Port Moresby, Mendi, and Mount Hagen), implying that the proportion of urban migrants was 16.8% in Wenani. Similarly, the Heli people mostly used the 3 zones (A, B, and C) during their lifetimes. Of the 583 individuals in Heli, 72 lived outside the Tari basin.

TABLE 2 Demographic change in Heli and Wenani from 1980 to 1995.

		Heli			Wenani		
		Male	**Female**	**Total**	**Male**	**Female**	**Total**
Total population							
1980		28	29	57	42	61	103
1995		37	44	81	69	85	154
Vital statistics, 1980–1995							
Births		8	11	19	21	28	49
Deaths		2	6	8	4	4	8
In-migration		23	28	51	28	23	51
Out-migration		20	18	38	18	23	41
Number of individuals either present or absent in 1980 and 1995							
1980	**1995**						
present	**present**	6	7	13	20	34	54
present	**absent**	22	22	44	22	27	49
absent	**present**	31	37	68	49	51	100

TABLE 3 Places of birth, residence, and death for all individuals in the study populations.

		Number of Huli correlated with environmental zones in the Tari basin						Outside the Tari basin (%)	Unknown	Total
		A (%)	B (%)	C (%)	D	E (%)	F (%)			
Heli	Place of birth	146 (20)	378 (51)	131 (18)	0	1	7	44 (6)	27	734
	Place of residence	79 (14)	302 (52)	127 (22)	0	0	3	72 (12)	2	585
	Place of death	40 (27)	67 (45)	17 (11)	0	0	1	4 (3)	20	149
Wenani	Place of birth	0	1	72 (8)	6	696 (74)	75 (8)	66 (7)	26	942
	Place of residence	0	0	73 (9)	7	497 (64)	62 (8)	129 (17)	10	778
	Place of death	0	0	3 (2)	0	126 (77)	10 (6)	8 (5)	17	164

For the Heli, marriage with neighboring groups (eg, the Duna in the Southern Highland province and the Ipili in Enga province) has been common (Biersack 1995). Thus, the individuals who stayed outside the Tari basin included both urban migrants and those who married in adjacent areas. The proportion of urban migrants was lower in Heli than in Wenani.

In Table 4, intra-Tari basin migration patterns for the Wenani and Heli people are examined by generation. In Heli, 132 individuals moved across a zone (19% of the total population), whereas 87 (9% of the total) did so in Wenani. The percentage of migrants in the total population was higher in older generations than in the younger generations (in Heli, G1 + G2, 25%; G3, 21%; G4 + G5, 12%; in Wenani, G1 + G2, 15%; G3, 14%; G4 + G5, 5%). This simply reflects the fact that the individuals in the younger generations have not yet moved because they are too young. Also, because the genealogical charts included individuals at various stages in life from newborn babies to the dead, the movements in older generations were defined according to the place of birth and the residence in old age, whereas in younger generations they tended to be defined by comparison between the places of birth and residence at a younger age.

Yet, it is also true that on average, movements among older generations occurred many years before the study, compared with the movements among the younger generations. Thus, the direction of the movements of the older generations tended to reflect migration decisions made in the past, whereas those of the younger generations are related to recent decisions. Table 4 shows that in either *hameigini*, movement from remote to central parts of the Tari basin exceeded that in the opposite direction for individuals in the older generations, and migrations from the central to the remote parts of the basin tended to predominate among the younger generations. The balance ("toward center" movements minus "toward remote areas" movements) was 7 for G1 + G2, 28 for G3, and -9 for G4 + G5 in Heli, and 4 for G1 + G2, 19 for G3, and -10 for G4 + G5 in Wenani.

TABLE 4 Balance between movements from remote to central parts and from central to remote parts in the Tari basin.

	Genealogical category	n	Toward center (from/to zone)				Toward remote areas (from/to zone)				Total (%)	Balance
			A/B	B/C	A/C	Total	B/A	C/B	C/A	Total		
Heli	G1+G2	109	11	3	3	17	6	3	1	10	27 (25%)	7
	G3	180	27	8	7	42	9	5	0	14	56 (21%)	28
	G4+G5	417	11	6	3	20	20	9	0	29	49 (12%)	–9
	Total	706	49	17	13	79	35	17	1	53	132 (19%)	26
			F/E	E/C+D	F/C+D	Total	E/F	C+D/E	C+D/F	Total		
Wenani	G1+G2	124	8	2	1	11	1	5	1	7	18 (15%)	4
	G3	312	11	20	0	31	9	3	0	12	43 (14%)	19
	G4+G5	485	3	5	0	8	14	4	0	18	26 (5%)	–10
	Total	921	22	27	1	50	24	12	1	37	87 (9%)	13

Discussion

One drawback of our genealogy-based method is that migration is defined on the basis of a comparison of the place of birth and the place of residence or death. Thus, migration is only a snapshot of where people are at the time of survey, and the migration histories of younger people may be incomplete. The finding that migration flows in opposite directions between the older and younger generations can be interpreted in either of 2 ways:

1. Migration patterns of individuals differed according to the stages of life history.
2. Migration patterns have changed over time.

In Huli society, infants, small children, and adolescent females usually live and move with their mother. Thus, the mother makes the decision about migration. Adolescent males leave their mother's house to live in a "men's house" and often wish to move to urbanized areas, preferably Port Moresby. Marriage is the event that most likely triggers migration across environmental zones. In a cognatic descent system, theoretically the number of *hameiginis* with which an individual affiliates genealogically is 2^n, where n is the number of generations from the individual to the founder of his or her lineage. For example, the Wenani people, whose founder is around 10 generations back from the present, can be members of 2^{10} (=1024) *hameiginis*. In practice, however, most affiliations are not recognized. Those with neighboring *hameiginis* are the best recognized, and hence people must usually find a spouse in a remote place, that is from a *hameigini* in different environmental zones. After marriage, a change of residence can take 2 forms: movement within an ecological zone involving multilocal households and cross-ecological zone movement on a semipermanent basis, triggered by tribal fighting, climatic perturbation, and other causes. Moves across the environmental zones were not prevalent among old people.

Here, the point is whether the direction of the migration flows also changed in accordance with stages in an individual's life, thus explaining the findings in Table 4. But our interview surveys suggested that it is the younger generations who prefer to move to urbanized central areas. Also, the motivation to move toward thinly populated mountainous areas, where it existed, was relatively stronger among older people because the demand for land was larger in the postmarital period when compared with the premarital period, and it increased as the number of children increased.

On the other hand, with regard to the possibility of changing migration patterns over time, the following explanations are possible. If the migration patterns of the Wenani and Heli changed over time, migrations to the central parts predominated in the past, whereas flows in the opposite direction have prevailed recently. In the present study, G3 was defined to include married individuals less than 60 years of age in 1995; their birth years are expected to range between 1935 and 1975 (when the marital age is 20 years). Assuming that the intergeneration interval is 25 years, G2 and G1 are expected to have been born between 1905 and 1950, and 1880 and 1925, respectively. Similarly, G4 may have been born after 1960 and G5 after 1985. Although the genealogical category and actual age do not necessarily correlate, it is also true as a general tendency that G1 and G2 individuals spent most of their active years around the time of the initial period of modernization since 1952 (when the Tari township was established). Among G3, G4, and G5, the younger the generation, the higher the population density in the Tari basin and the larger the intrabasin disparities in the extent of modernization because population increase and rural development since 1952 have progressed in a linear fashion. It is plausible that individuals in G1 and G2 tended to move toward the center in search of cash or modernized lifestyles. It is also true that the central part of the basin was overpopulated and the younger generation could not cultivate gardens large enough for survival. The authors' fieldwork in Kikida *hameigini* (located in the administrative center; see Figure 1) in 1998 revealed that the per capita garden size was less than half that in Wenani or Heli (unpublished data). A gold rush from the end of the 1980s to the beginning of the 1990s may also have induced migrations from the central parts toward the north among the Heli people.

Migration flows from the surrounding areas toward the central parts of the Tari basin have already been pointed out by Wood (1985) and Allen (1995). They suggested that the migrations are taking place in response to degradation of garden soils in the surrounding parts and to greater economic opportunities in the central parts. The migration patterns among the older generations in the present study may be consistent with such statements. Migrations toward remote areas by the younger generations may be a relatively recent phenomenon caused by overpopulation in the central part of the Tari basin.

Intrapopulation migration is one of the key factors in food security in high-density residential areas. Density-dependent migration has been reported in many historical populations (Relethford 1986); migrations from overpopulated areas to thinly populated areas may have sustained food security in the places of origin. In contrast, people often move regardless of the population density of destinations in modernized human populations (Ohtsuka et al 1985). Access to a cash economy, modernized lifestyles, and transportation can be power-

ful pull factors for migrants (Lee 1966). Migration to overpopulated areas will impair the food security of the destinations; depressed food security is often observed in the neighborhoods of urbanized areas to which many people have moved from rural areas (Joumard 1993). In this respect, intrapopulation migration in the Huli may have diminished food security around the administrative center and some people have responded to this by migrating to thinly populated remote areas. Under the dynamic changes of human–environment relationships in the basin, the Huli's flexible systems of migration and land use may have operated to ensure survival. This example illustrates that indigenous social organization has merits for the sustainability of this mountain region. Further studies with a larger sample size would be needed to reach clearer conclusions about migration patterns in the Tari basin, as well as in other densely populated areas.

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REFERENCES

Allen B. 1995. At your own peril: studying Huli residence. *In:* Biersack A, editor. *Papuan Borderlands: Huli, Duna and Ipili Perspectives on the Papua New Guinea Highlands.* Ann Arbor, MI: University of Michigan Press, pp 141–171.

Biersack A, editor. 1995. *Papuan Borderlands: Huli, Duna and Ipili Perspectives on the Papua New Guinea Highlands.* Ann Arbor, MI: University of Michigan Press.

Bourke RM. 1989. Sweet potato (*Ipomoea batatas*) production and research in Papua New Guinea. *Papua New Guinea Journal of Agriculture, Forestry and Fisheries*. 33:89–108.

Clark J. 1990. *Perception of Development by Women of the Tari Basin, Southern Highlands Province: A Sub-Project of Integrated Rural Development Programme Evaluation in Papua New Guinea.* NRI Discussion Paper 61. Port Moresby, Papua New Guinea: National Research Institute.

Foley WA. 1986. *The Papuan Language of New Guinea.* Cambridge: Cambridge University Press.

Glasse RM. 1968. *The Huli of Papua.* Paris: Mouton.

Joumard I. 1993. The informal sector, employment and the institutional framework. *In:* OECD (Organization for Economic Cooperation and Development), editor. *The Changing Course of International Migration.* Paris: OECD.

Lee ES. 1966. A theory of migration. *Demography* 3:47–57.

Lehmann D, Vail J, Vail P, Crocker J, Pickering H, Alpers M, Tari Demographic Surveillance Team. 1997. *Demographic Surveillance in Tari, Southern Highlands Province, Papua New Guinea: Methodology and Trends in Fertility and Mortality Between 1979 and 1993.* Goroka and Tari: Papua New Guinea Institute of Medical Research.

Ohtsuka R, Kawabe T, Inaoka T, Akimichi T, Suzuki T. 1985. Inter- and intrapopulation migration of the Gidra in lowland Papua: a population-ecological analysis. *Human Biology* 57:33–45.

Relethford JH. 1986. Density-dependent migration and human population structure in historical Massachusetts. *American Journal of Physical Anthropology* 69:377–388.

Umezaki M, Kuchikura Y, Yamauchi T, Ohtsuka R. 2000. The impact of population pressure on food production: an analysis of land use change and subsistence pattern in the Tari basin in Papua New Guinea Highlands. *Human Ecology* 28:359–381.

Umezaki M, Yamauchi T, Ohtsuka R. 1999. Diet among the Huli in Papua New Guinea Highlands when they were influenced by the extended rainy period. *Ecology of Food and Nutrition* 37:409–427.

Vail J. 1995. All that glitters: the Mt. Kare gold rush and its aftermath. *In:* Biersack A, editor. *Papuan Borderlands: Huli, Duna and Ipili Perspectives on the Papua New Guinea Highlands.* Ann Arbor, MI: University of Michigan Press, pp 343–374.

Wood AW. 1985. *Stability and Permanence of Huli Agriculture.* Department of Geography, Occasional Paper No 5 (new series). Port Moresby, Papua New Guinea: University of Papua New Guinea.