東京大学 「人類生態学」
2006年６月27日　1-2限

人類生態学の最近のトピックス

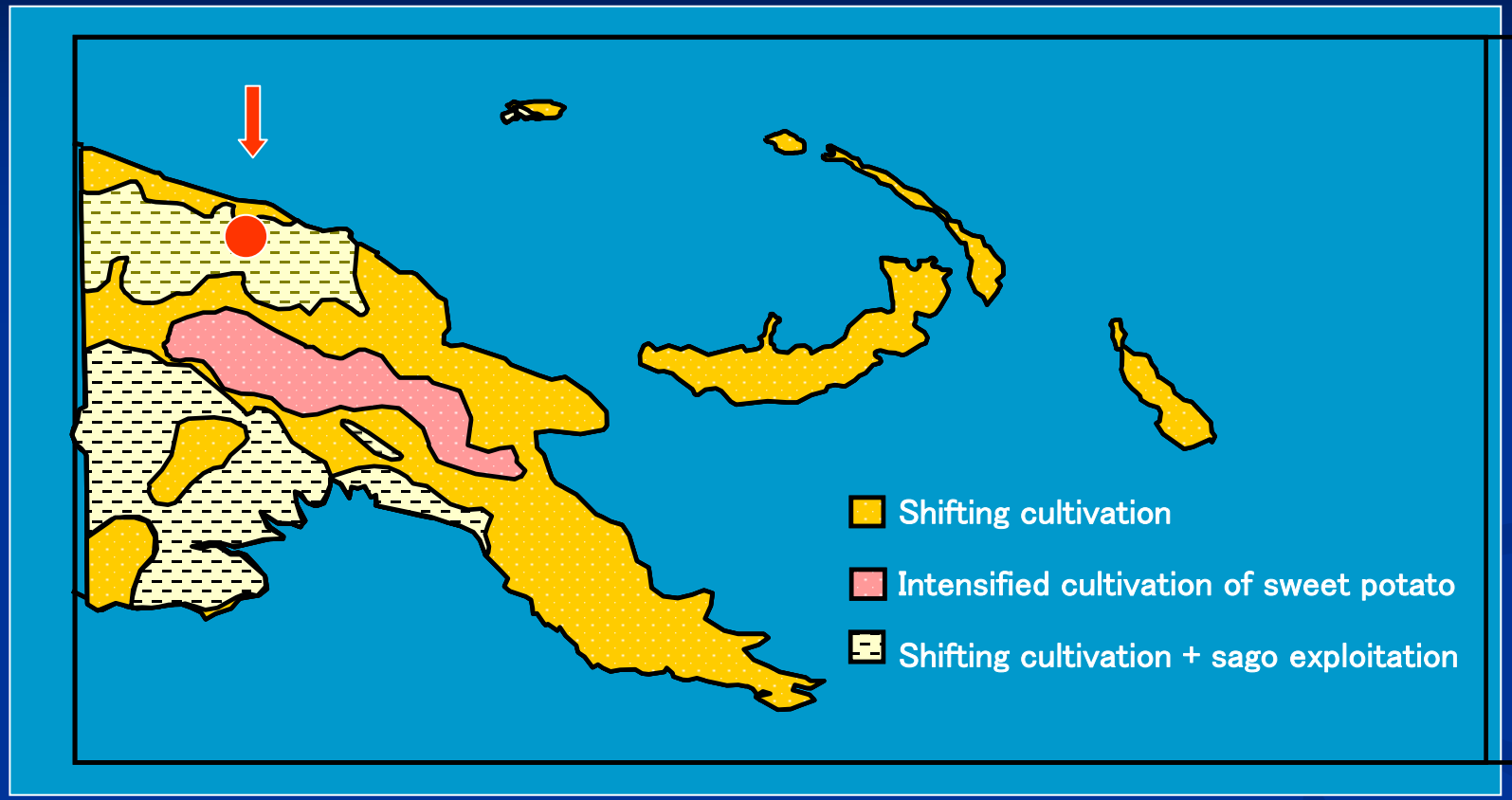
梅崎昌裕

人類の直面する問題へのフィールドワークの寄与

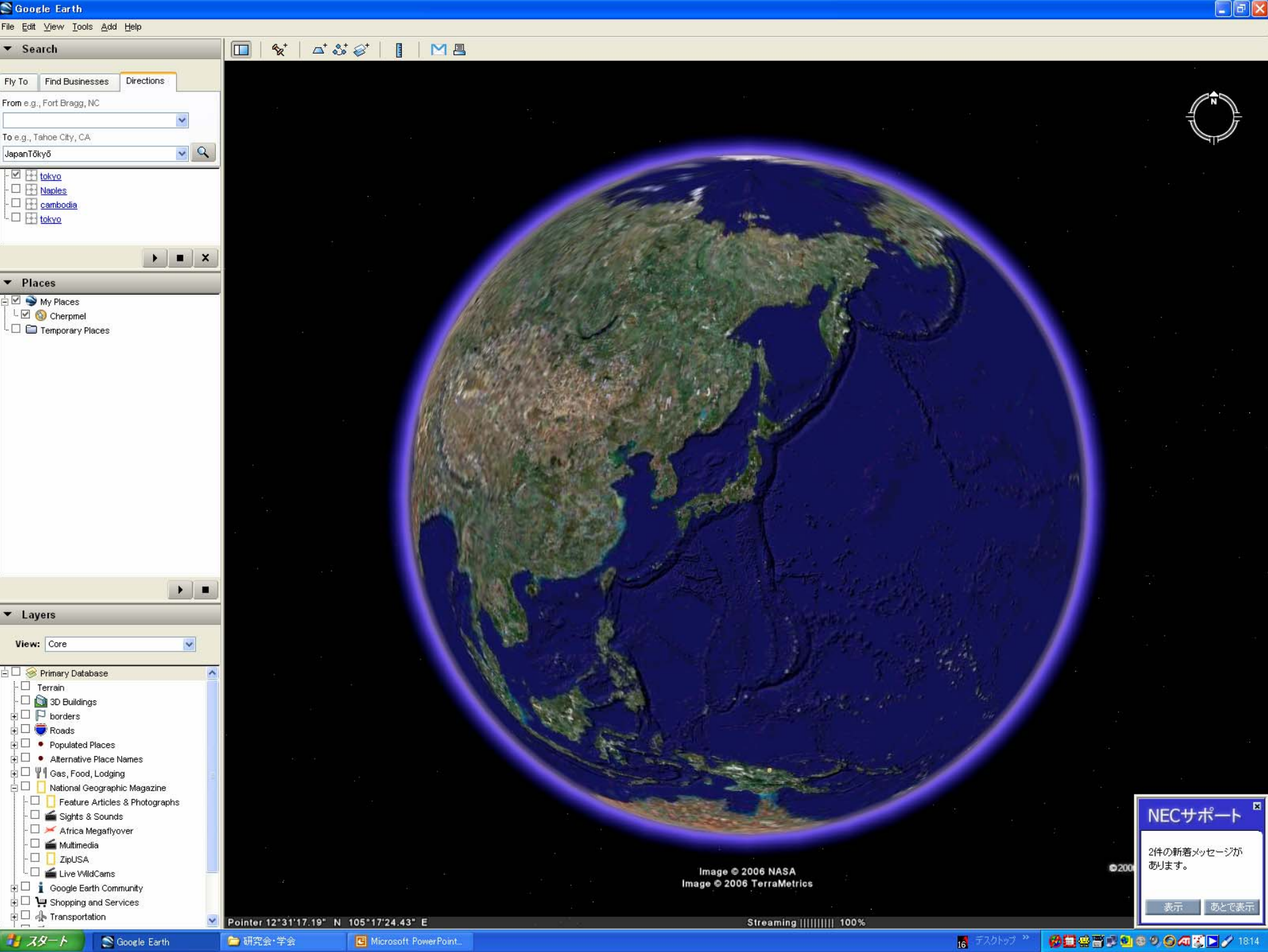
事例（1）：なぜ人口は増加しはじめたのか

（パプアニューギニア・東セピック）

An example of subsistence change in Papua New Guinea



Current agricultural system in Papua New Guinea


Google Earth
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Search
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To e.g., Tahoe City, CA
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My Places
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Layers
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Terrain
3D Buildings
borders
Roads
Populated Places
Alternative Place Names
Gas, Food, Lodging
National Geographic Magazine
Feature Articles & Photographs
Sights & Sounds
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研究会・学会
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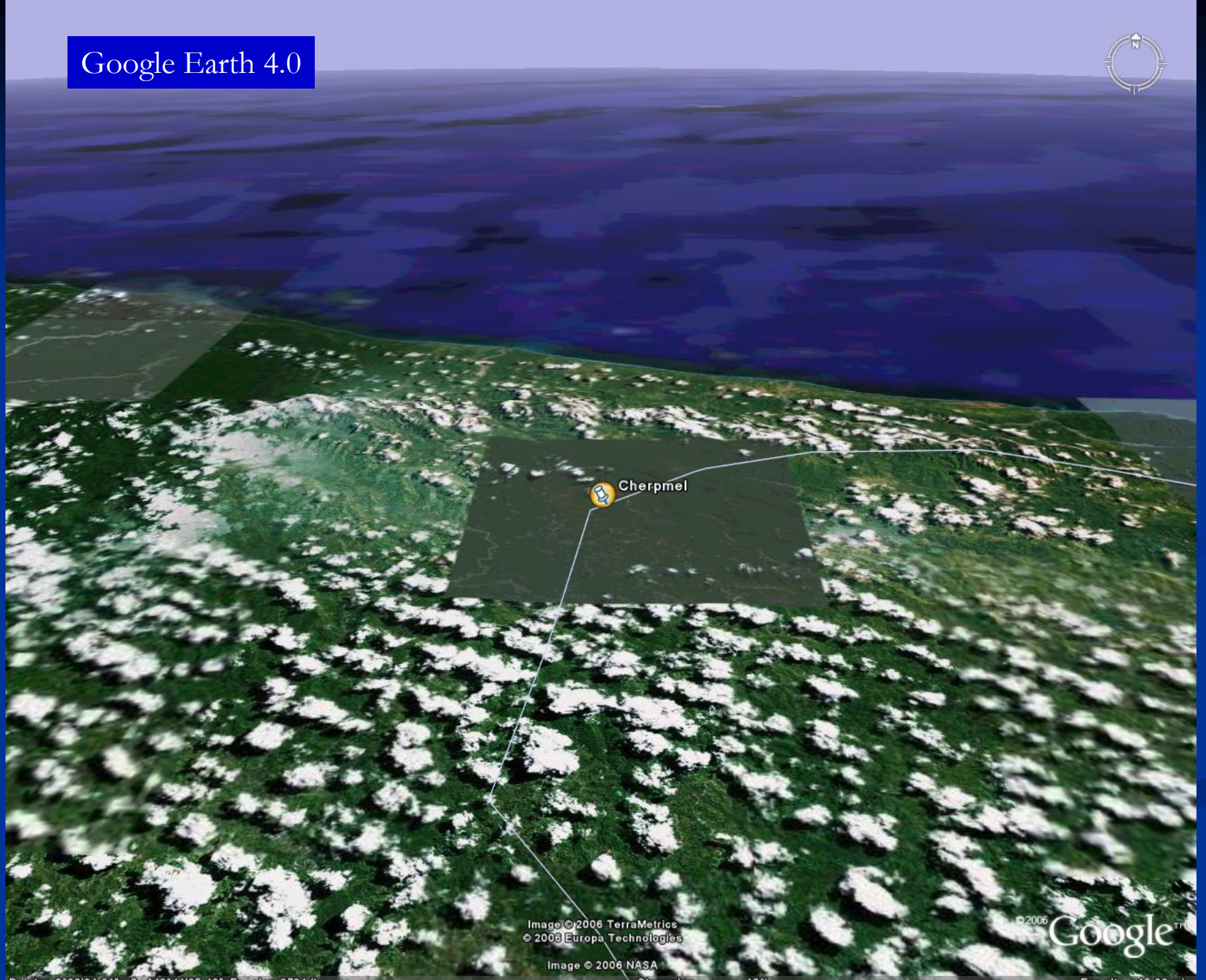
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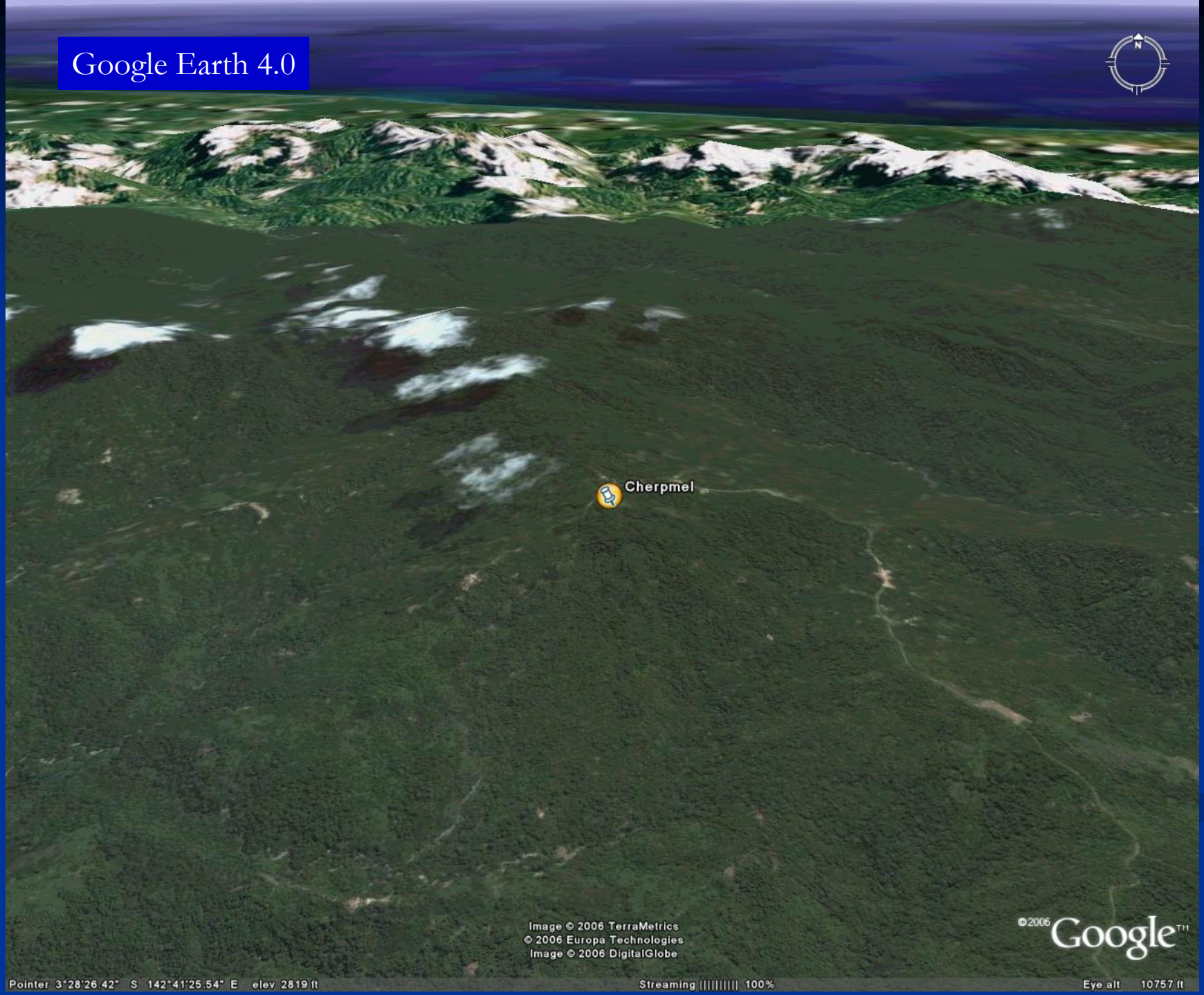
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Umezaki, M. and Ohtsuka, R. (1998). Impact of rural-urban migration on fertility: a population ecology analysis in the Kombio, Papua New Guinea. Journal of Biosocial Science, 30: 411-422.

Umezaki, M. and Ohtsuka, R. (1996). Microdemographic analysis for population structure from a closed to open system: a study in the Kombio, Papua New Guinea. Man and Culture in Oceania, 12: 19-30.

＜東セピック州コンビオ＞
人口3500の言語集団。5つの方言集団と35の村落をもつ。サゴ椰子の澱粉採集、焼畑による根菜類の栽培、狩猟・採集を生業とする。家族計画は1992年時点で導入されていない。

＜年表＞

1930	西洋人とのファーストコンタクト
1935	大地震
1944	日本軍の侵攻
1952	言語族のテリトリーに飛行場が建設される
1957	飛行場のそばに教会がつくられる
1961	小学校の建設
1965	換金作物（コーヒー）の導入
1970	町と村落をむすぶ道路が建設される
1975	パプアニューギニア独立
1983	地域の保健センター建設

Google Earth 4.0

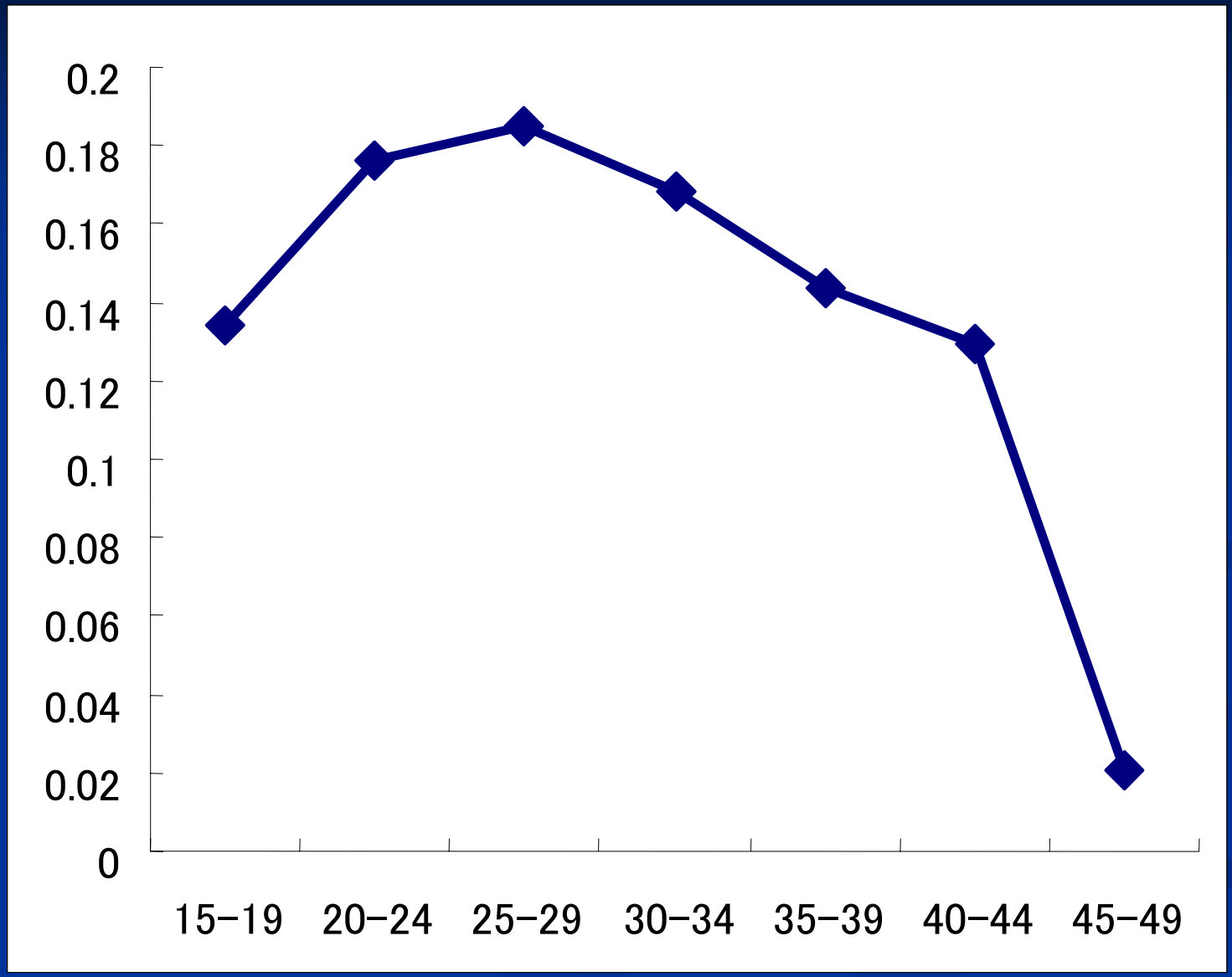
Rural-urban migration since the European contact

Labor-contract
Visit relatives
Jailed

＜出生にかかわる規範＞
（1930年代のパトロールレポートより）

1. 月経期間中の女性は男性から離れて生活する。
2. 子供が小さい時期（3歳くらいまで）には性交をおこなうべきではない。
3. 次の日に畑にでかける夜には性交をおこなうべきではない。
4. 男性が摂取することによって避妊効果のある木の皮

1920-39年出生コホートの出生力パタン



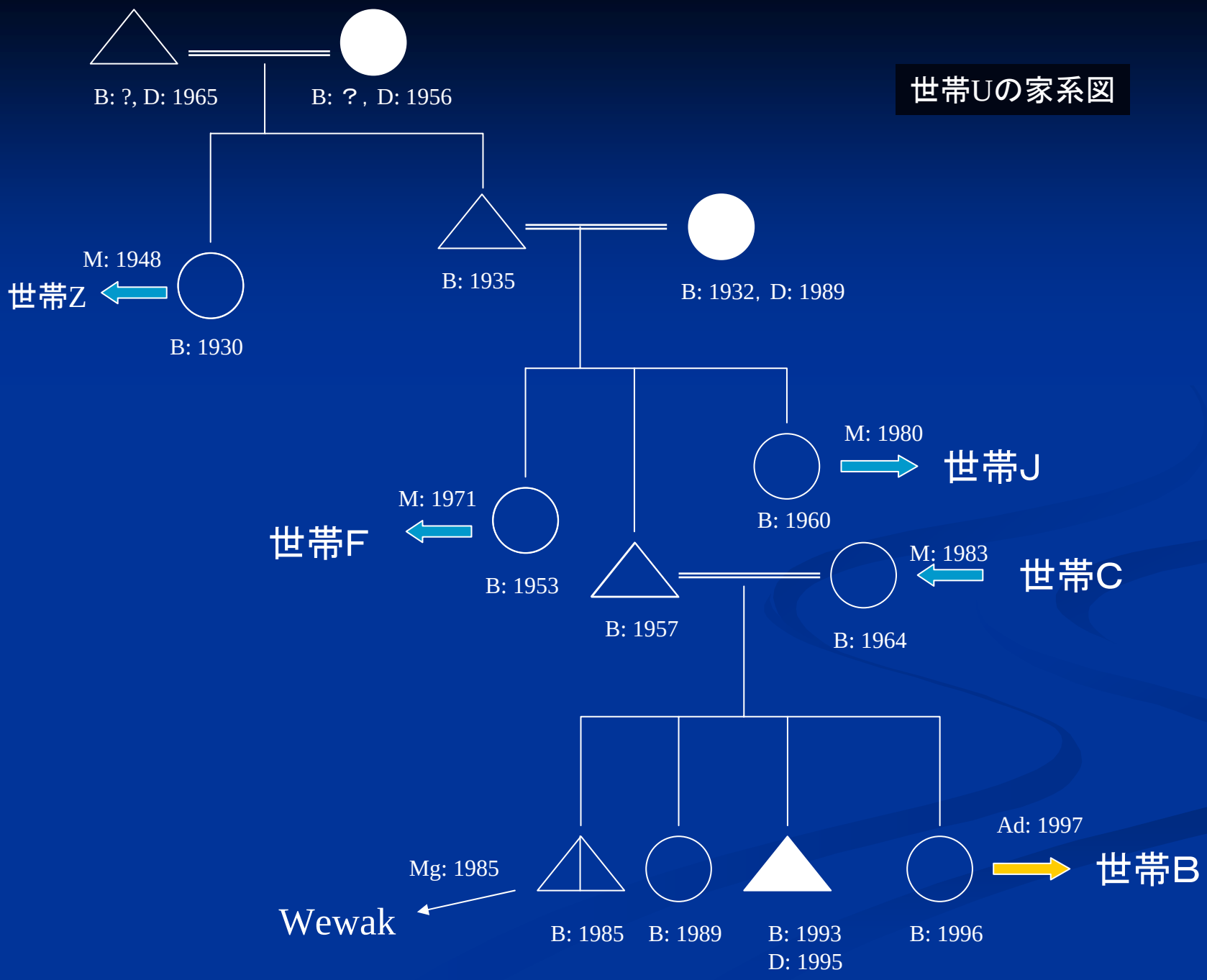
1950～2000年：価値観・食生活の変容～文化変容

1. キリスト教の布教による伝統的慣習の否定
   ＜性交頻度，出産後禁欲期間＞

2. 換金作物の導入による現金収入と食生活の変化：
   サゴ澱粉とイモ類（低タンパク）→米やサバ缶、コンビーフなど（高タンパク）
   ＜妊よう力，初経年齢，若年性不妊＞

＜方法＞　1. ひとつの方言集団の全体を対象とした家系図の再構築（N=1724），
2. 家系図に登場する個人の出生年、死亡年、婚姻年、移動歴を推定


92 9 20


世帯Uの家系図
B: ?, D: 1965
B: ？, D: 1956
M: 1948
世帯Z
B: 1930
B: 1935
B: 1932, D: 1989
M: 1980
世帯J
B: 1960
M: 1971
世帯F
B: 1953
B: 1957
M: 1983
世帯C
B: 1964
Ad: 1997
世帯B
Mg: 1985
Wewak
B: 1985
B: 1989
B: 1993
D: 1995
B: 1996

<分析>

－期間モデルによって出生率・死亡率の変化を検討
　　1940-59年：近代化の初期
　　1960-79年：教育・教会の布教の開始
　　1980-92年：食生活の変容が本格化

－コホートモデルによって出生率の変化を検討
　　1920-39年生まれ：近代化する以前に出産
　　1940-59年生まれ：近代化した後に出産（1）
　　1960-79年生まれ：近代化した後に出産（2）

－人口移動の有無によって出生率の違いを検討
　　1900年：全員が村落部に居住
　　1930-50年代：プランテーションへの契約労働者として男性が出稼ぎ
　　1960年代：都市部への人口移動が増加

●農村部における出生率と死亡率の変化（期間モデル）

期間	普通出生率	普通死亡率	内婚率	人口増加率
1940-59	32/1000	23/1000	91%	0.85%
1960-79	42/1000	26/1000	92%	1.3%
1980-92	42/1000	26/1000	82%	1.9%

近代化の初期に出生率は増加した。死亡率はほとんどかわらない。内婚率（同じ言語グループの男女による婚姻の割合）は減少。

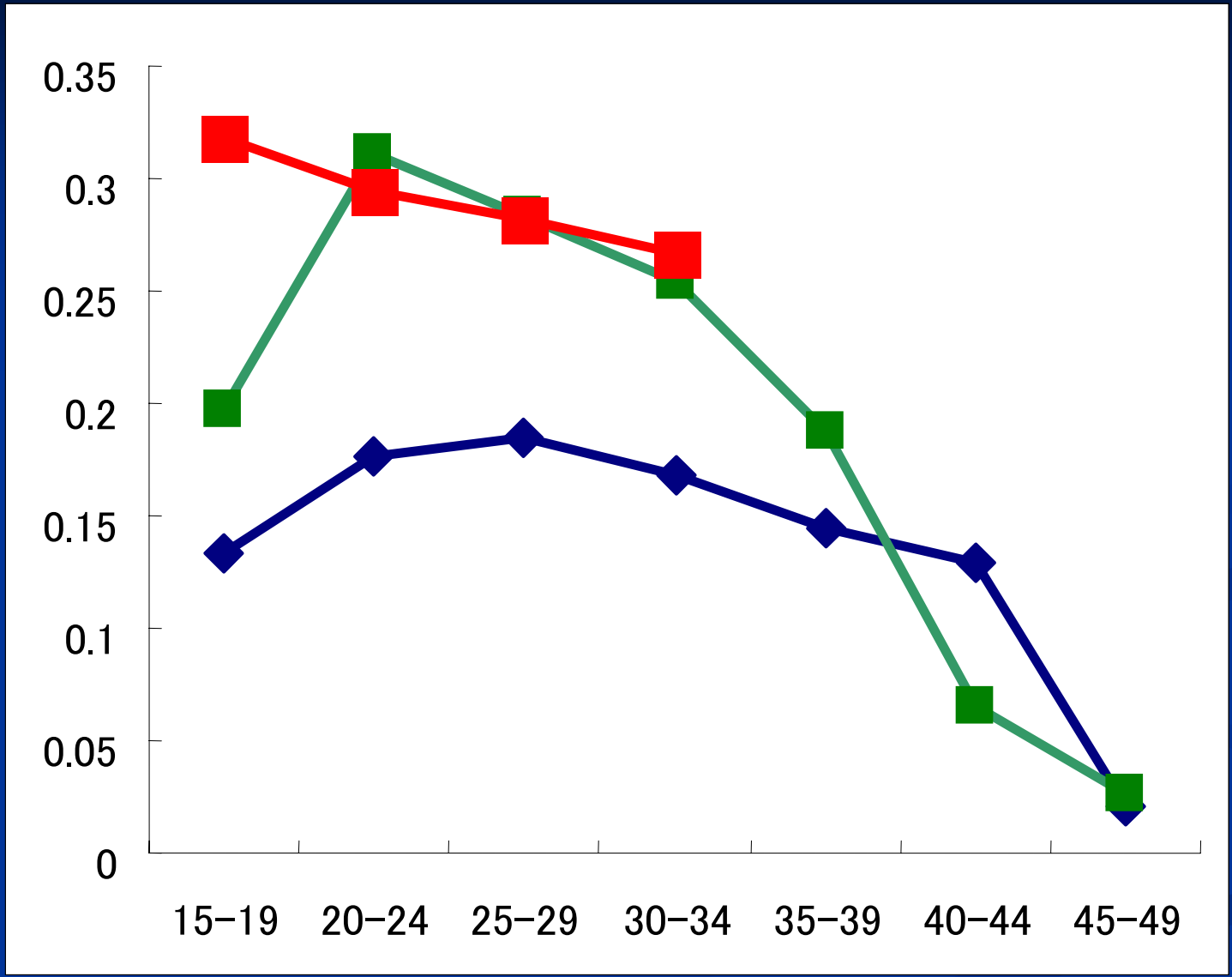
コホート別出生パタンの比較（農村ー都市）

Table 5. Age-specific marital fertility rates in R–R and U–U in three birth cohorts

Age group (years)	R–R				U–U			
	Women born in 1920–39	Women born in 1940–59	Women born in 1960–79	Total	Women born in 1920–39	Women born in 1940–59	Women born in 1960–79	Total
15–19	0·134	0·197	0·318	0·224	0·286	0·158	0·310	0·256
20–24	0·176	0·311	0·295	0·263	0·400	0·317	0·337	0·328
25–29	0·185	0·283	0·282	0·235	0·000	0·232	0·127	0·186
30–34	0·168	0·254	0·267	0·193	0·000	0·096	0·000	0·078
35–39	0·144	0·188		0·155	0·000	0·107		0·092
40–44	0·129	0·065		0·093	0·000	0·000		0·000
45–49	0·021	0·027		0·020	0·000	0·000		0·000
TMFR*	4·782	6·619		5·923	3·430	4·550		4·703

*Total marital fertility rate.

農村部における出生力の年齢パタン

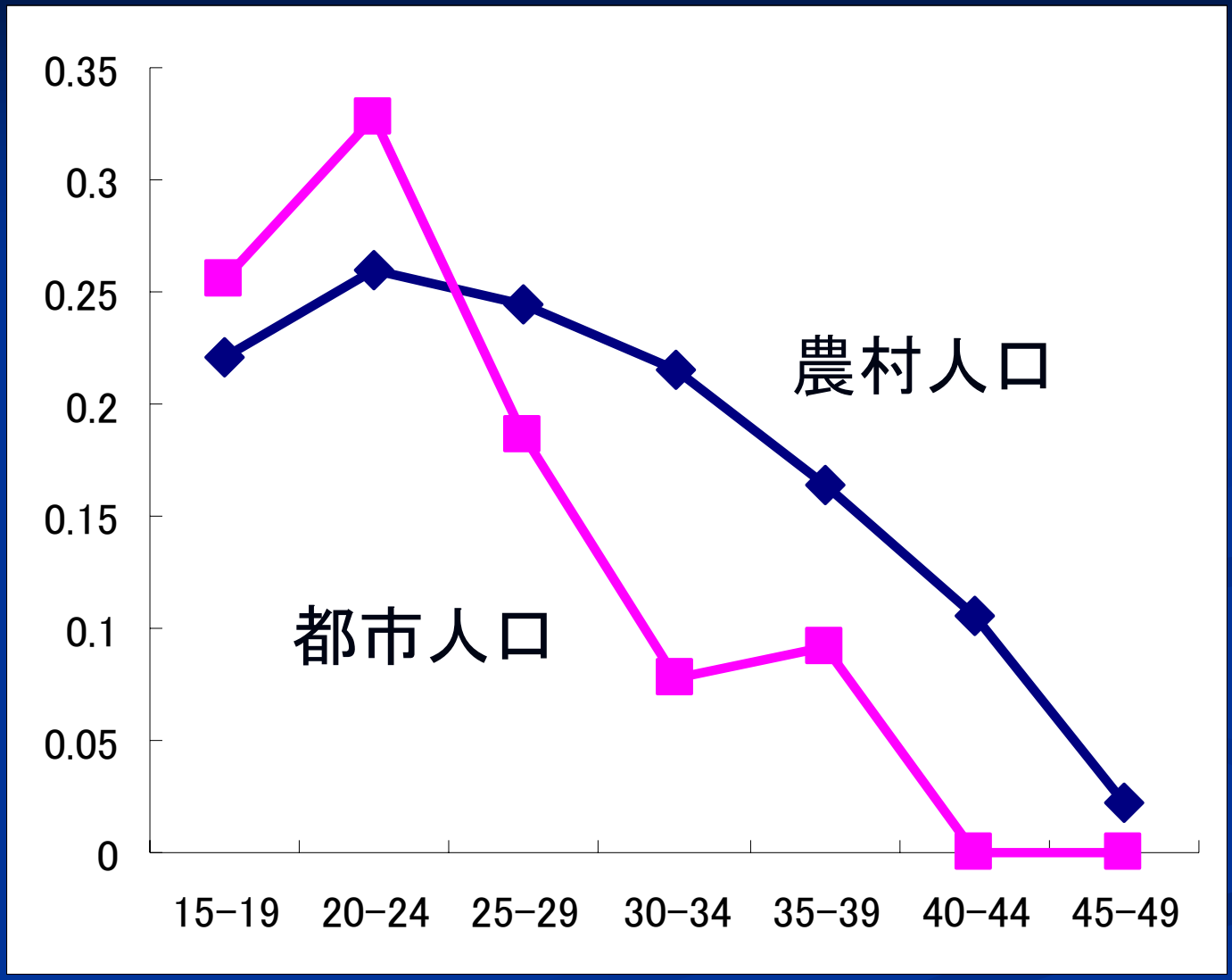


農村ー都市人口移動が出生力に与えた影響

Table 4. Age-specific marital fetility rates for all subjects in R–R, U–U and R–U

Age group (years)	Age-specific marital fertility rates				Ratios	
	R–R	U–U	R–U	Total	U–U/R–R	R–U/R–R
15–19	0·221	0·256	0·171	0·224	1·16	0·78
20–24	0·260	0·328	0·085	0·263	1·26	0·33
25–29	0·244	0·186	0·185	0·235	0·76	0·76
30–34	0·215	0·078	0·056	0·193	0·36	0·26
35–39	0·164	0·092	0·125	0·155	0·56	0·76
40–44	0·106	0·000	0·000	0·093	0	0
45–49	0·022	0·000	0·000	0·020	0	0
TMFR*	6·161	4·703	3·109	5·923	0·76	0·50

*Total marital fertility rate.


0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
15-19
20-24
25-29
30-34
35-39
40-44
45-49
農村人口
都市人口

＜まとめ＞

1．近代化の最初の段階で、社会が「伝統的に」維持していた人口調整メカニズム（産後の性交禁忌、性交にかかわる規範など）が放棄されることで、出生率が上昇し、結果的に人口の増加につながったと考えられる。

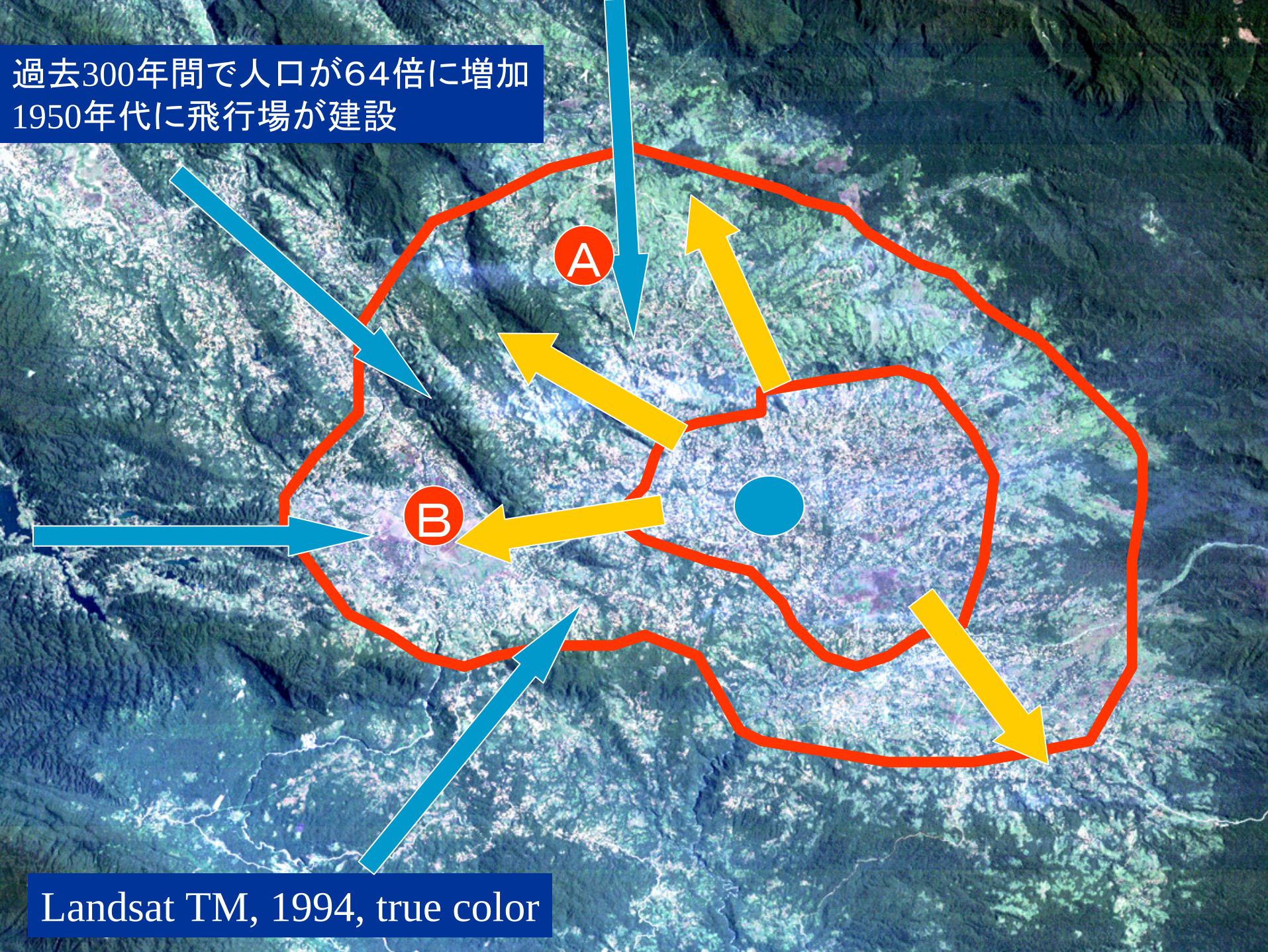
2．都市部と農村部の集団は出生力の年齢パタンが異なる．都市部では若年層の出生率が高く，年齢とともに急速に低下する（避妊が効果をもつ集団の特徴）

3．都市への人口移動をおこなった夫婦の出生力は村落部で暮らしつづけた夫婦のそれよりも低い傾向にあり、結果的に都市への人口移動は集団の出生力を低下させる効果をもっていたといえる。

人類の直面する問題へのフィールドワークの寄与

事例（2）：人口増加の結末

（パプアニューギニア・高地）


過去300年間で人口が64倍に増加
1950年代に飛行場が建設
A
B
Landsat TM, 1994, true color

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

Masahiro Umezaki,[1,3] Yukio Kuchikura,[2] Taro Yamauchi,[1] and Ryutaro Ohtsuka[1]

The impact of increase in population on land use and subsistence pattern was examined in two environmentally contrasting Huli-speaking communities, Heli and Wenani, in the Tari basin in Papua New Guinea Highlands. Despite the similar extent of population increase in both communities, the damage to land differed markedly. In Heli, a decrease in land productivity owing to excessive agricultural use has induced farmers to shorten the fallow duration, which in turn has led to further land degradation and difficulties in increasing food production. In contrast, Wenani villagers have coped with the population increase by enlarging areas for cultivation and possibly will be able to double their present production level, although increasingly frequent disputes over land rights have restricted peoples' access to fertile areas. During a period of climatic perturbations in 1994, land and labor productivities of crops were three times higher in Wenani than in Heli, which suffered a severe food shortage. This difference in ability to cope with climatic perturbations may have increased with population growth. The findings in the present study suggest that the effects of population pressure on food production may differ between communities, depending on the indigenous environment and subsistence pattern.

KEY WORDS: land use; population pressure; environmental degradation; Papua New Guinea Highlands.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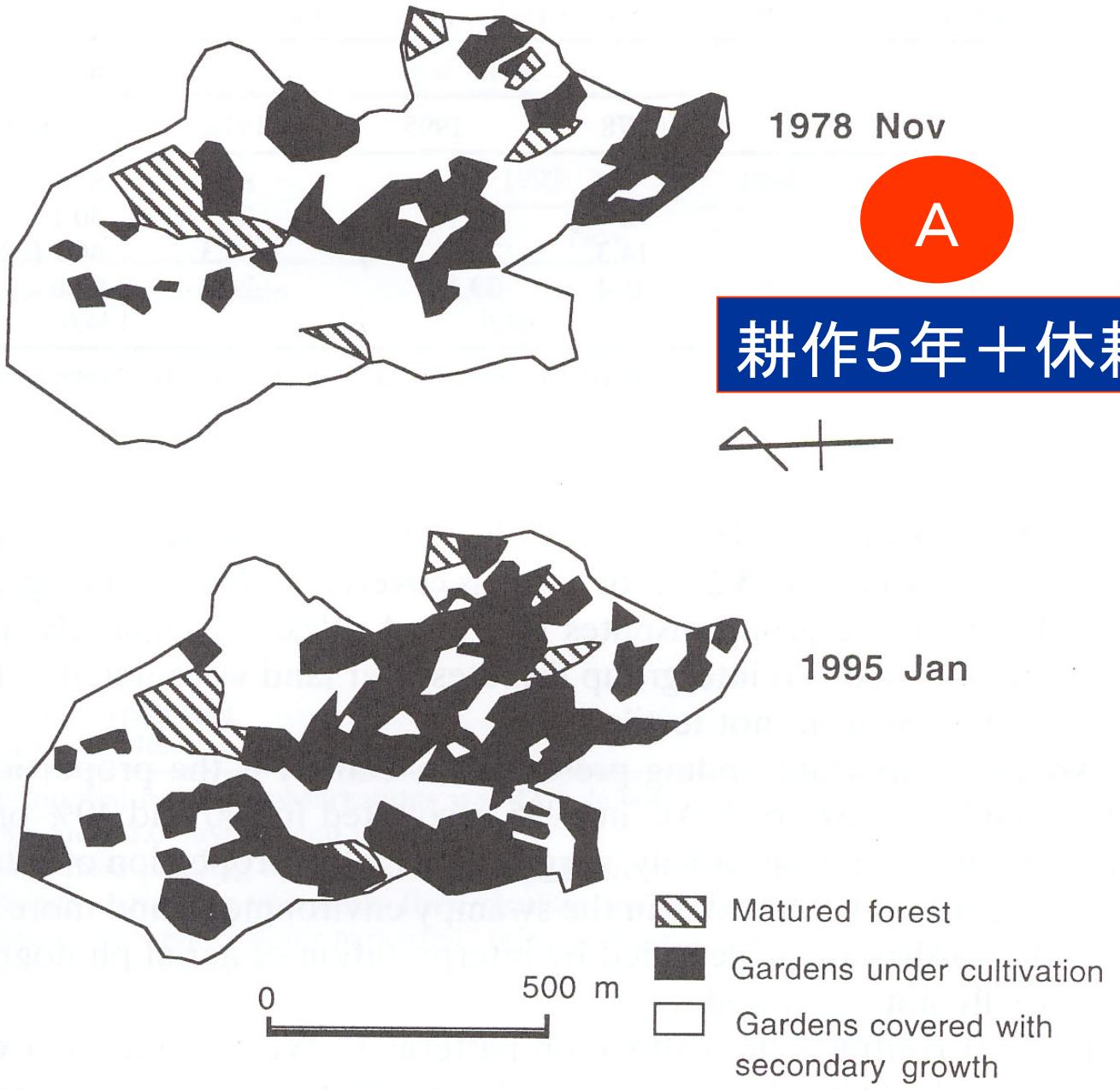


Fig. 3. Land use maps in Heli in 1978 and 1995.

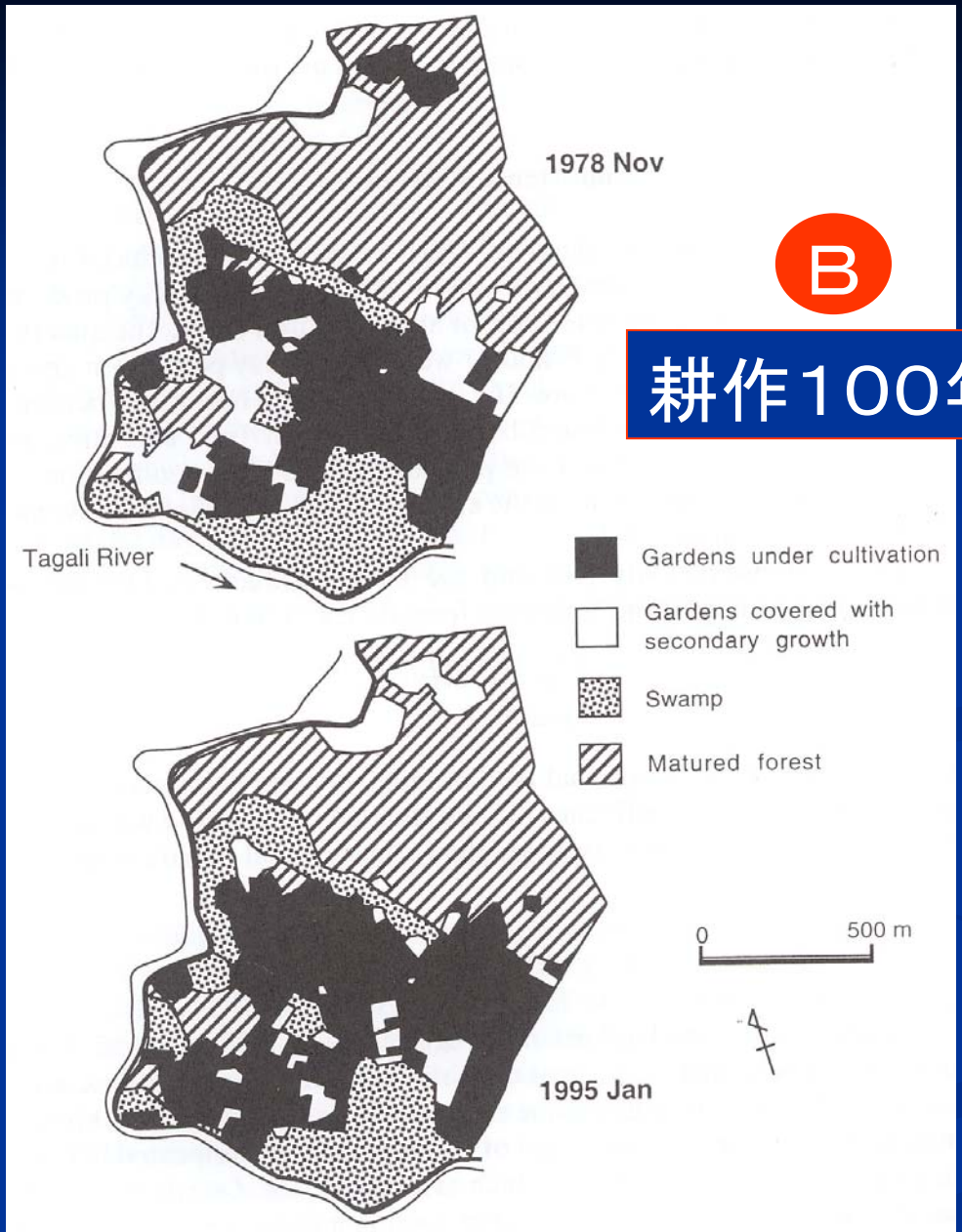


Fig. 2. Land use maps in Wenani in 1978 and 1995.

B

耕作100年＋休耕0年

Table I. Land Use Patterns (ha) in [illegible] and Wenani in 1978 and [illegible]

	[illegible]		Wenani	
	1978	1995	1978	1995
Matured forest	4.8	4.2	87.6	87.6
Swamp	0	0	31.7	30.1
Gardens under cultivation	14.3	27.3 (10.8)[a]	38.3	46.2 (22.5)[a]
Gardens with secondary growth	45.4	33.1	26.9	20.6
Total		64.6		184.6

[a]Areas of gardens under actual cultivation (GAC) measured by us in 1995 are shown in parentheses.

A

B

A 耕作地:休耕地＝14：27 → 45:33

＝ 1:2 → 1： 0.73

休耕期間＝0.73÷2 ＝ およそ3分の1に短縮

B そもそも休耕期間は耕作に必要ない

Ａ：　人口増加によって休耕期間が短縮
　　→従来の耕作システムの崩壊

Ｂ：　人口増加しても従来の耕作システムを維持

どのような違いが生まれたか.

Table IV. Per Person Figures for Ecological Variables

	W ii (B)	(A)
Time spent in horticulture in a day[a] (min)	98	85
Sweet potato fed to a pig per day (kcal)	2064	1545
Number of pigs per person	1.9	0.6
Energy intake from garden crops (kcal)	1723	865
Energy intake from pigs and other animal (kcal)	80	32
Energy intake from purchased foods (kcal)	336	324
Annual labor hours (hr/ha)	4847	4370
Land productivity (kcal/ha)	$16.6 \cdot 10^6$	$5.7 \cdot 10^6$
Labor productivity (kcal/hr)	3419	1300

[a]Time spent in horticulture by an adult was converted to per person time using the proportion of adults in all members of the households under study (14/30 in Wenani and 21/53 in Heli); time spent in horticulture by a nonadult was negligible.

ただし，Bも耕作地が絶対的に不足すると問題

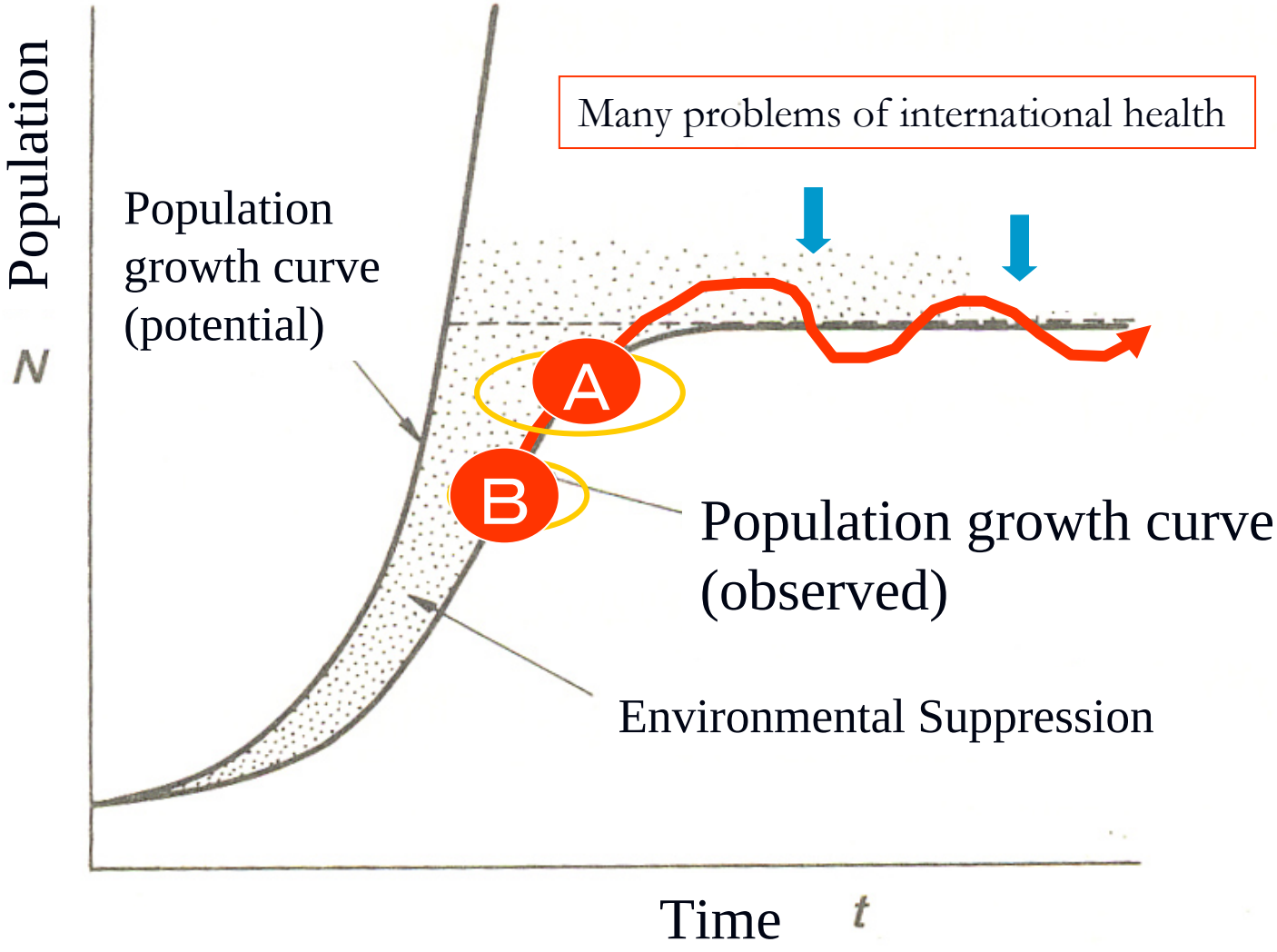


Figure. Population growth curve and carrying capacity

人類の直面する問題へのフィールドワークの寄与

事例（3）：災害援助について

（パプアニューギニア・高地）

DIET AMONG THE HULI IN PAPUA NEW GUINEA HIGHLANDS WHEN THEY WERE INFLUENCED BY THE EXTENDED RAINY PERIOD

MASAHIRO UMEZAKI*, TARO YAMAUCHI and RYUTARO OHTSUKA

Department of Human Ecology, School of International Health, Graduate School of Medicine, University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113-0033, Japan

(Received October 3, 1997; in final form May 9, 1998)

Household food consumption surveys (weighed records for 7 days) were conducted in two Huli-speaking communities, Heli in the slope zone and Wenani in the flat plain, in Papua New Guinea Highlands when their food productivity had decreased after an extended rainy period in 1994. Despite lowered productivity of garden crops in both communities, daily adult male energy and protein intakes in Wenani (12930 kJ, 3090 kcal and 56 g, respectively) exceeded the requirement and safe levels by FAO/WHO/UNU (1985), whereas those in Heli (7750 kJ, 1852 kcal and 35 g) were below both levels. The difference was mostly attributable to three times higher productivity of food energy in the normal period in Wenani than in Heli. The findings are relevant to the maintenance of food security among Papua New Guinea Highlanders.

KEY WORDS: Food consumption, dietary intake, population pressure, climatic perturbation, modernization, Papua New Guinea Highlands

1994 July-August: long-lasted rain

↓

Bad effect for the sweet potato that were just planted

↓

Productivity reduced to 60% of normal in October-November 1994

Long rain

Lowered productivity

7 8 9 10 11 12 1 2 3

Heli lost the adaptability to climatic perturbation

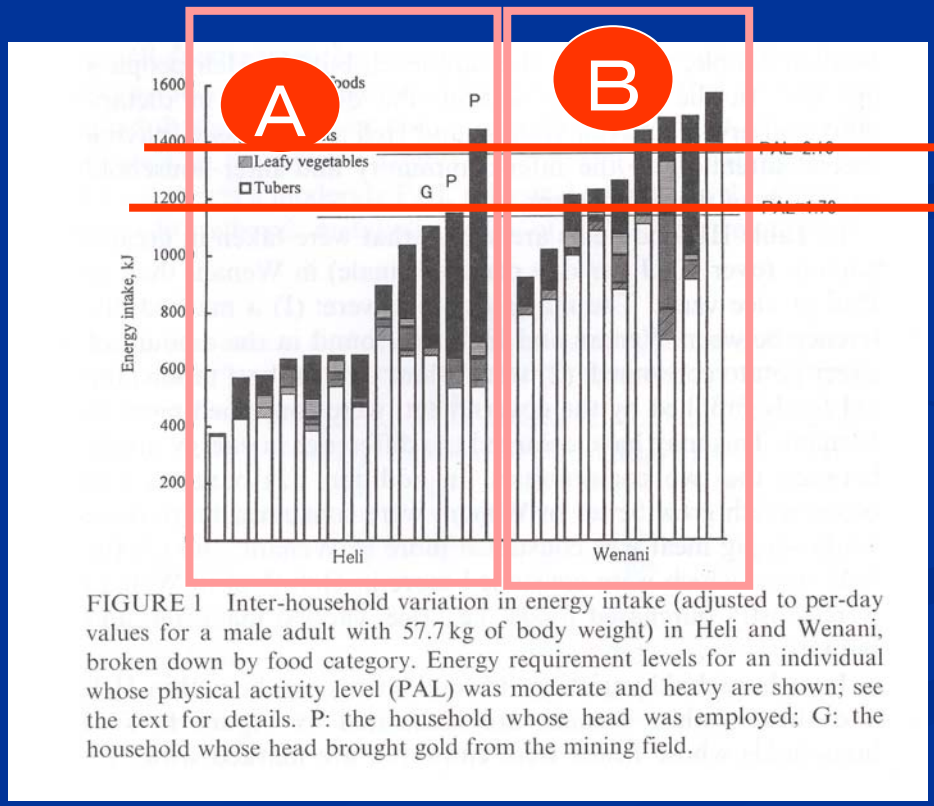
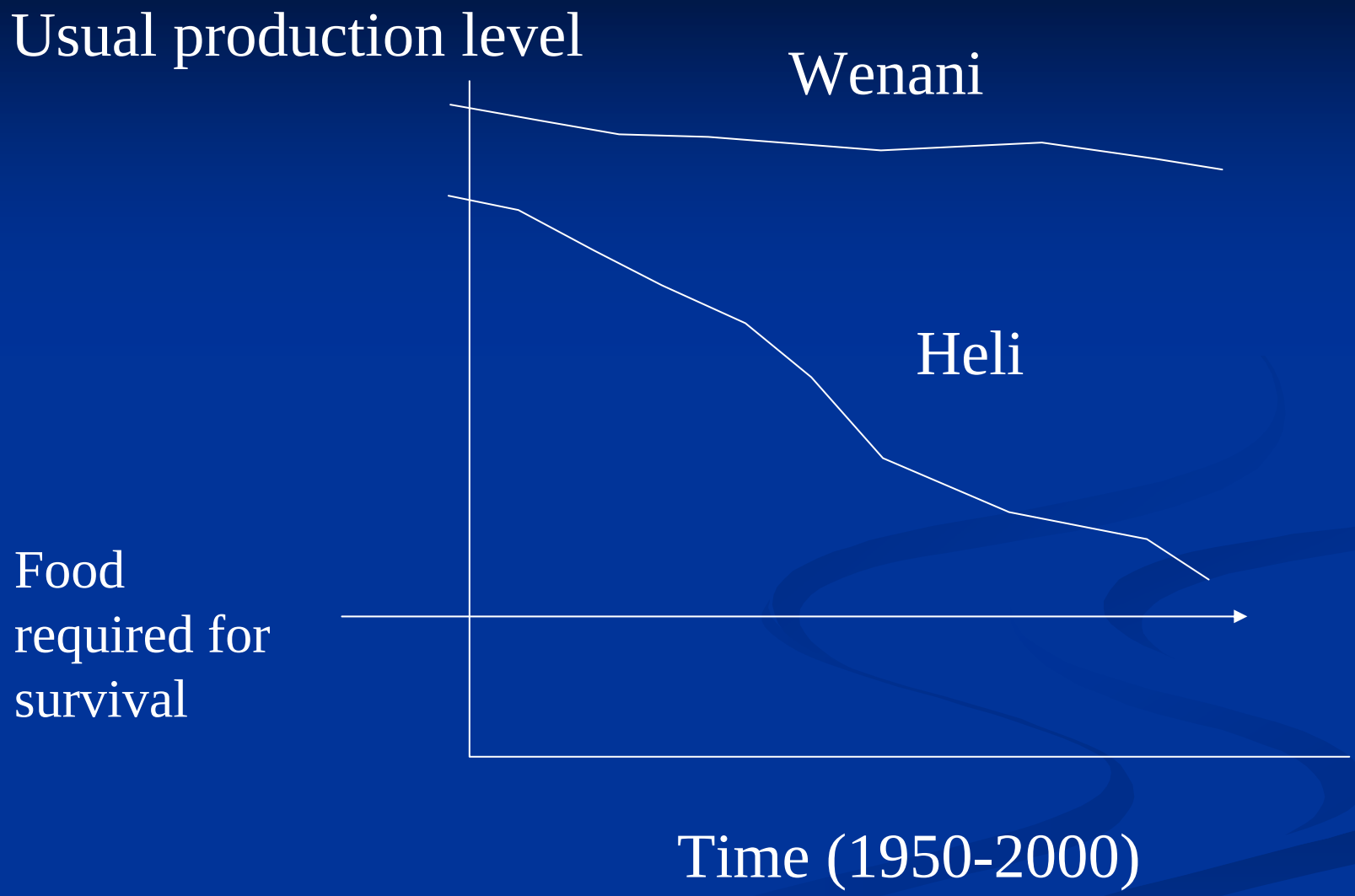


FIGURE 1 Inter-household variation in energy intake (adjusted to per-day values for a male adult with 57.7 kg of body weight) in Heli and Wenani, broken down by food category. Energy requirement levels for an individual whose physical activity level (PAL) was moderate and heavy are shown; see the text for details. P: the household whose head was employed; G: the household whose head brought gold from the mining field.

Wenani maintained the adaptability to climatic perturbation


Usual production level
Wenani
Heli
Food required for survival
Time (1950-2000)

長雨に対する食糧支援

→　天候不順に対する弾力性（対応力）を
維持していた（B）にのみ．なぜかというち，
Bは河川沿いにあり，一部の畑が水につかった
ことからアピールしやすかった．

（A）は援助物資を受けとることができなかった．

食料援助に携わった人の責任？

国際保健学への提言：

「伝統」社会はふつう生活に必要な以上の食料を生産している．それはその社会の”safety-net” として機能している．

だから，ふだんの状況では問題は顕在化していない．

対象社会の安定性評価には，天候不順などふつうではない状況も考慮する必要がある．

人類の直面する問題へのフィールドワークの寄与

事例（４）：農村―都市人口移動による肥満人口の増大

Population growth in rural areas

Rural-urban migration
Health problems in urban areas
Vulnerable communities in urban areas

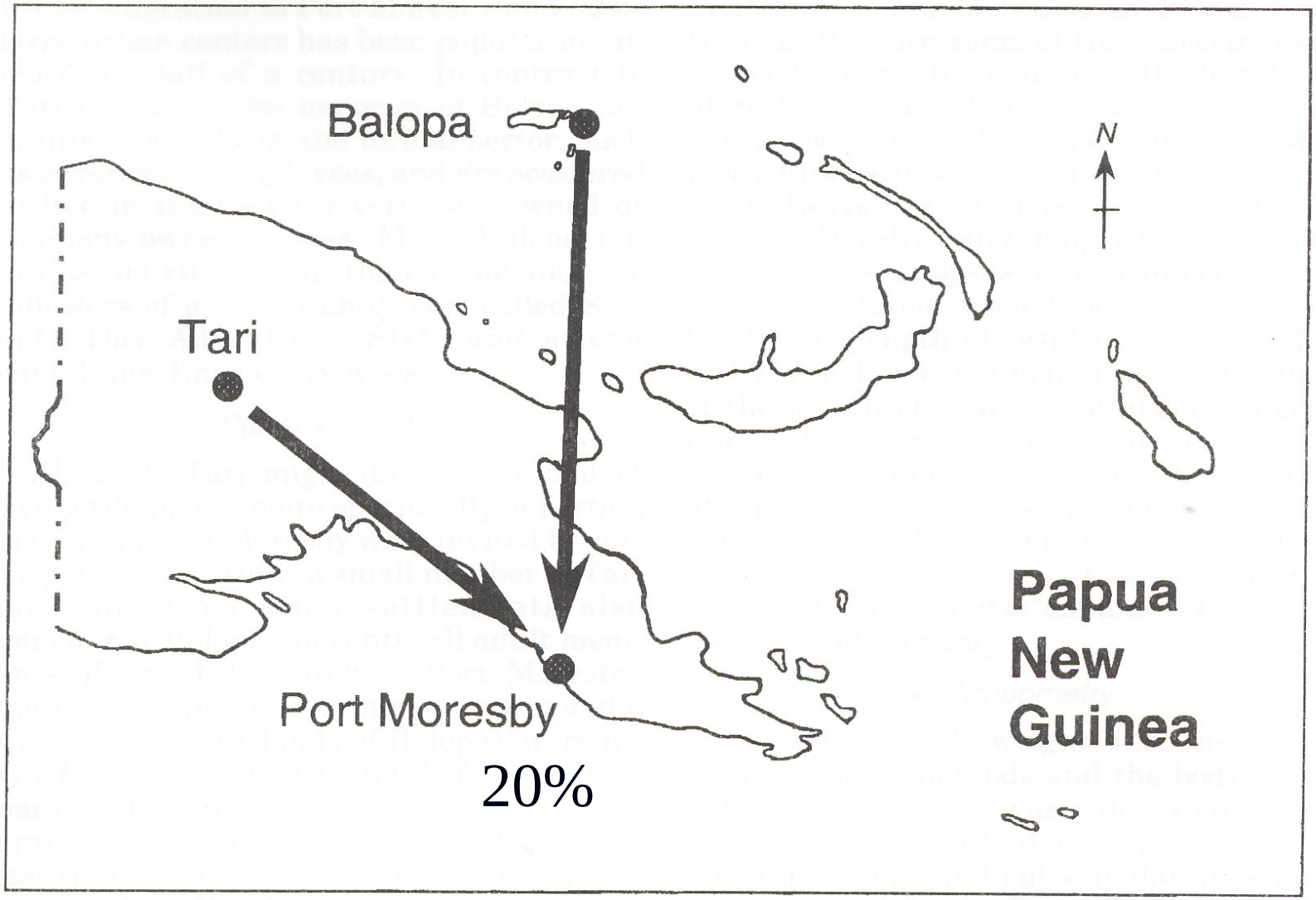


Fig. 1. Location of Port Moresby and homelands of Balopa and Tari migrants.

Cardiovascular Risk Factors of Migrants in Port Moresby From the Highlands and Island Villages, Papua New Guinea

KAZUMI NATSUHARA,[1]* TSUKASA INAOKA,[2]
MASAHIRO UMEZAKI,[1] TARO YAMAUCHI,[1] TETSURO HONGO,[3]
MEGUMI NAGANO,[2] AND RYUTARO OHTSUKA[1]
[1]*Department of Human Ecology, School of International Health, Graduate School of Medicine, University of Tokyo, Tokyo, Japan*
[2]*Department of Public Health, Kumamoto University School of Medicine, Kumamoto, Japan*
[3]*Laboratory of Human Ecology, Yamanashi Institute of Environmental Sciences, Yamanashi, Japan*

ABSTRACT This study examined cardiovascular disease (CVD) risk factors, i.e., obesity, blood pressures, and serum lipoproteins and apoproteins, in relation to sociocultural characteristics in two rural–urban migrant populations (n = 173 adult males and females) in Port Moresby, the capital of Papua New Guinea. Tari migrants from the highlands and Balopa migrants from the islands differ genetically. More importantly, the lifestyle of the latter is more Westernized than that of the former in both Port Moresby and their homelands. The results demonstrate that CVD risk factors vary markedly among the origin/sex groups and that the length of stay in Port Moresby on CVD risk factors was significant only in Balopa males, most of whom had professional or skilled full-time jobs and were considered to have more stress. This study identified different CVD risk factors in the migrant groups: obesity or fatness for the Balopa migrants, and serum lipoproteins and apoproteins, particularly lipoprotein(a), for the Tari migrants. Am. J. Hum. Biol. 12:655–664, 2000.

Table 2. Energy and nutritional intake per day per male adult of the Huli in rural and urban areas

	Urban area (Port Moresby)				Rural area (Tari)			
	Energy (kJ)	Protein (g)	Fat (g)	Crude fiber (g)	Energy (kJ)	Protein (g)	Fat (g)	Crude fiber (g)
tuber and sago starch	837	2.1	0.4	1.3	7141	18.2	3.7	11.3
cereals	3336	16.4	1.8	0.5	1076	4.7	0.5	0.2
leafy vegetable	224	3.9	0.2	2.0	308	7.5	0.3	4.4
other vegetable	144	0.8	0.5	0.6	146	1.3	0.1	0.7
bean	38	0.5	0.4	0.1	115	1.7	0.1	0.4
fruit	495	1.1	0.1	0.7	236	0.7	0.4	0.3
fish, meat, and egg	2325	38.6	44.0	0.0	590	11.1	10.2	0
oil	971	2.2	19.3	0.0	695	0.0	12.3	0
fastfood	270	2.9	2.9	0.1	0	0	0	0
confectionery	514	1.9	5.5	0.1	30	0.1	0.3	0.0
beverage	890	1.4	0.2	0.0	1	0.0	0.0	0
others	199	0.2	0.3	0.0	3	0.0	0.0	0.0
Total	10243	72.1	75.7	5.3	10341	45.4	27.8	17.2

Mean body weight for the rural subjects was 57.7 kg and that for the urban subjects was 72.6 kg.

Table 4. Height, weight and body mass index (BMI) for the Huli in rural and urban a

		n	Height (SD*)	Weight (SD)	BMI (SD)
Male	Rural	110	157.5 (5.7)	59.4 (6.6)	23.9 (2.1)
	Urban	101	161.8 (5.3)	65.5 (7.2)	25.0 (2.4)
Female	Rural	58	147.5 (4.1)	50.0 (6.5)	22.9 (2.5)
	Urban	39	151.5 (5.3)	62.1 (11.3)	27.1 (4.5)

Means of height, weight and BMI were smaller among the rural people than among the urban people in males and females with a statistical significance of $P<0.001$. The statistical method used was the t-test, or Welch's test in case of inequal variation.

* SD: standard deviation.

Table 6. LSMEANS and standard error of body physics, blood pressure, and serum lipids by softdrink consumption (age, sex, marital status, and occupation

	Soft drinks		
	<2.5 bottles	2.5 bottles≦	*P*
n	49	50	
BODY PHYSIQUE			
Body mass index (kg/m2)	26.3±0.6	27.4±0.6	0.04
%fat	21.5±0.9	23.6±0.9	0.02
Sum of skinfold thicknesses (mm)	28.6±2.0	32.5±1.9	0.04
BLOOD PRESSURE			
Systolic BP (mmHg)	113.9±2.3	116.9±2.2	0.16
Diastolic BP (mmHg)	68.2±1.8	72.1±1.7	0.02
SERUM LIPIDS			
Total cholesterol (mg/dl)	183.4±8.4	207.7±8.0	<0.01
HDL cholesterol (mg/dl)	36.6±1.6	36.9±1.5	0.83

TABLE 1. Age, migrant history, and sociodemographic and lifestyle characteristics of males and females from Manus and Tari

		Males		Females	
		Balopa n = 24	Tari n = 96	Balopa n = 20	Tari n = 33
Age	<35 years	18	54	9	15
	≥35 years	6	42	11	18
Length of residence in Port Moresby[a]	<5 years	7*	55	2*	15
	5–<15 years	11	25	9	13
	≥15 years	6	16	9	5
Residential pattern in Port Moresby[b]	Sedentary	19	80	20	29
	Circular	5	16	0	4
Length of education (including vocational schools)	No	1*	33	0*	13
	<7	2	36	2	14
	7–<10	7	22	8	6
	≥10	14	5	10	0
Employment	Full-time	17*	16	12*	0
	Part-time	1	7	0	0
	Informal sector[c]	0	16	0	9
	Jobless	4	55	7	24
	Student	2	2	1	0
Housing	Own	16*	27	18	31
	Lodging	8	69	2	2
Smoking[d]	No	13*	30	20*	20
	Yes	11	64	0	13
Drinking alcohol	No	13	32	19	33
	Yes	11	62	1	0
Beverages	<3 cans or bottles/day	24*	41	18*	18
	≥3 cans or bottles/day	0	52	2	15

[a]Length of residence in Port Moresby was calculated as follows; (number of years since migration to Port Moresby) × (residential habit index). Residential habit index: 1 = almost always in Port Moresby, 0.5 = almost half in Port Moresby, 0.25 = almost always in home village.
[b]Residential habit: sedentary = almost always in Port Moresby, circular = almost half in Port Moresby and almost always in home village.
[c]Activities such as small-scale retailing and street vending; goods sold were betel nuts, iceblocks, and various small things.
[d]The data of smoking and drinking alcohol for two Tari males and beverages for three Tari males were missing.
*Significantly different between Balopa and Tari groups of either sex at $P < 0.05$.

*TABLE 2. Means and standard deviations of age, anthropometric, and blood pressure variables in Balopa and Tari migrants by sex**

	Males				Females			
	Balopa (n = 24)		Tari (n = 96)		Balopa (n = 20)		Tari (n = 33)	
Variable (unit)	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (years)	32.1	11.6	32.6	9.1	35.4	9.2	33.3	7.0
Body mass index (kg/m^2)	26.4	4.7	25.1	2.3	27.8	6.4	27.7	4.3
Sum of skinfold thicknesses[a] (mm)	28.5	14.3[d]	21.4	5.6	55.2	18.2[e]	39.1	14.8
Fat free mass[b] (kg)	60.1	7.7[e]	55.0	4.8	43.9	6.7	44.9	5.2
Centripetal fat ratio[c]	0.68	0.04	0.69	0.06	0.59	0.06[e]	0.67	0.09
Systolic BP (mmHg)	118	13	117	12	118	23	112	11
Diastolic BP (mmHg)	74	10	70	9	75	15	70	10

*Note: Wilcoxon test was used to compare migrant groups.
[a]Triceps skinfold + subscapla skinfold.
[b]Fat-free mass was calculated using the equations by Durnin and Womersley (1974).
[c]CFR: Subscapular/(Subscapular + Triceps) skinfold thicknesses.
[d]Significantly different between Balopa and Tari groups of either sex at $P < 0.05$.
[e]$P < 0.01$.

*TABLE 3. Means and standard deviations of serum lipoproteins and apoproteins in Balopa and Tari migrants by sex**

	Males				Females			
	Balopa (n = 24)		Tari (n = 96)		Balopa (n = 20)		Tari (n = 33)	
Variable (unit)	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total cholesterol (mg/dl)	179	38	189	40	187	38	202	40
HDL cholesterol (mg/dl)	41	7[c]	33	8	42	14	39	7
Total/HDL cholesterol	4.55	1.34[c]	6.03	2.05	4.83	1.63	5.42	1.89
Apoprotein-A1 (mg/dl)	126	17[c]	108	18	126	27	118	14
Apoprotein-B (mg/dl)	94	26[b]	114	28	103	33	117	31
Apo-B/Apo-A1	0.76	0.26[c]	1.10	0.37	0.86	0.32	1.02	0.35
β lipoprotein (mg/dl)	395	98[a]	445	107	412	121	449	120
Lipoprotein(a) (mg/dl)	10.5	9.4[c]	29.1	27.6	11.0	11.9*	25.8	27.5

*Note: Wilcoxon test was used to compare the migrant groups.
[a]Significantly different betwen Balopa and Tari groups of either sex at $P < 0.05$.
[b]$P < 0.01$.
[c]$P < 0.001$.

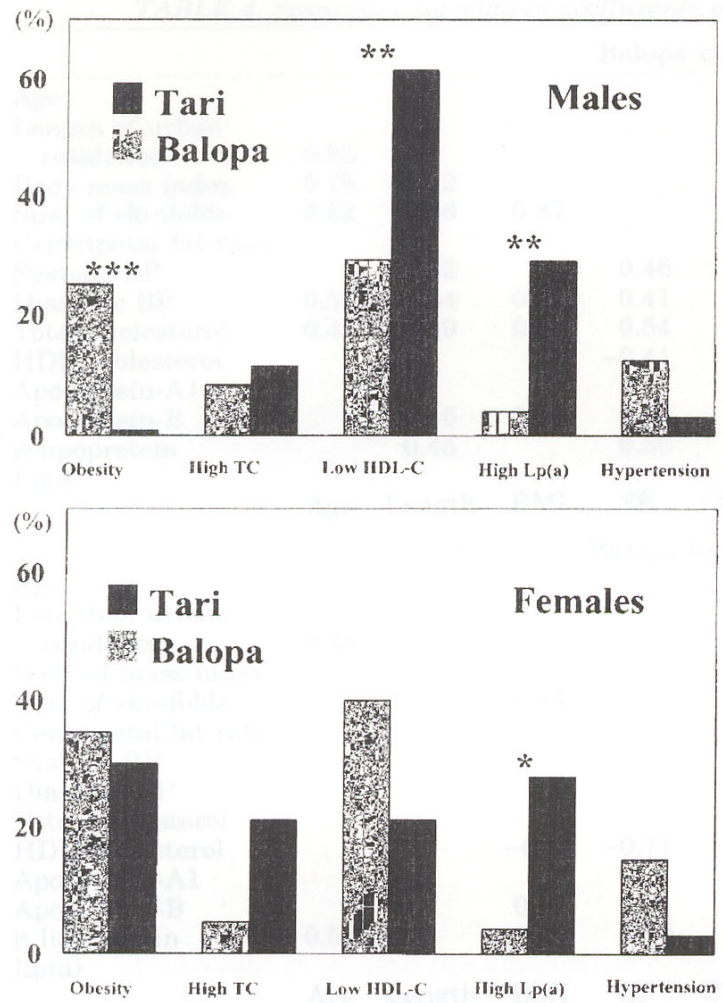


Fig. 2. Percentages of high risk individuals in Balopa and Tari migrants. Obesity: >30 kg/m^2 (BMI), high TC: >240 mg/dl, low HDL-C: <35 mg/dl, high Lp(a): >40 mg/dl, hypertension: >140 mmHg systolic blood pressure or >90 diastolic blood pressure. *Significantly different between Balopa and Tari for either sex at $P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$.

非オーストロネシアン
Vs オーストロネシアン

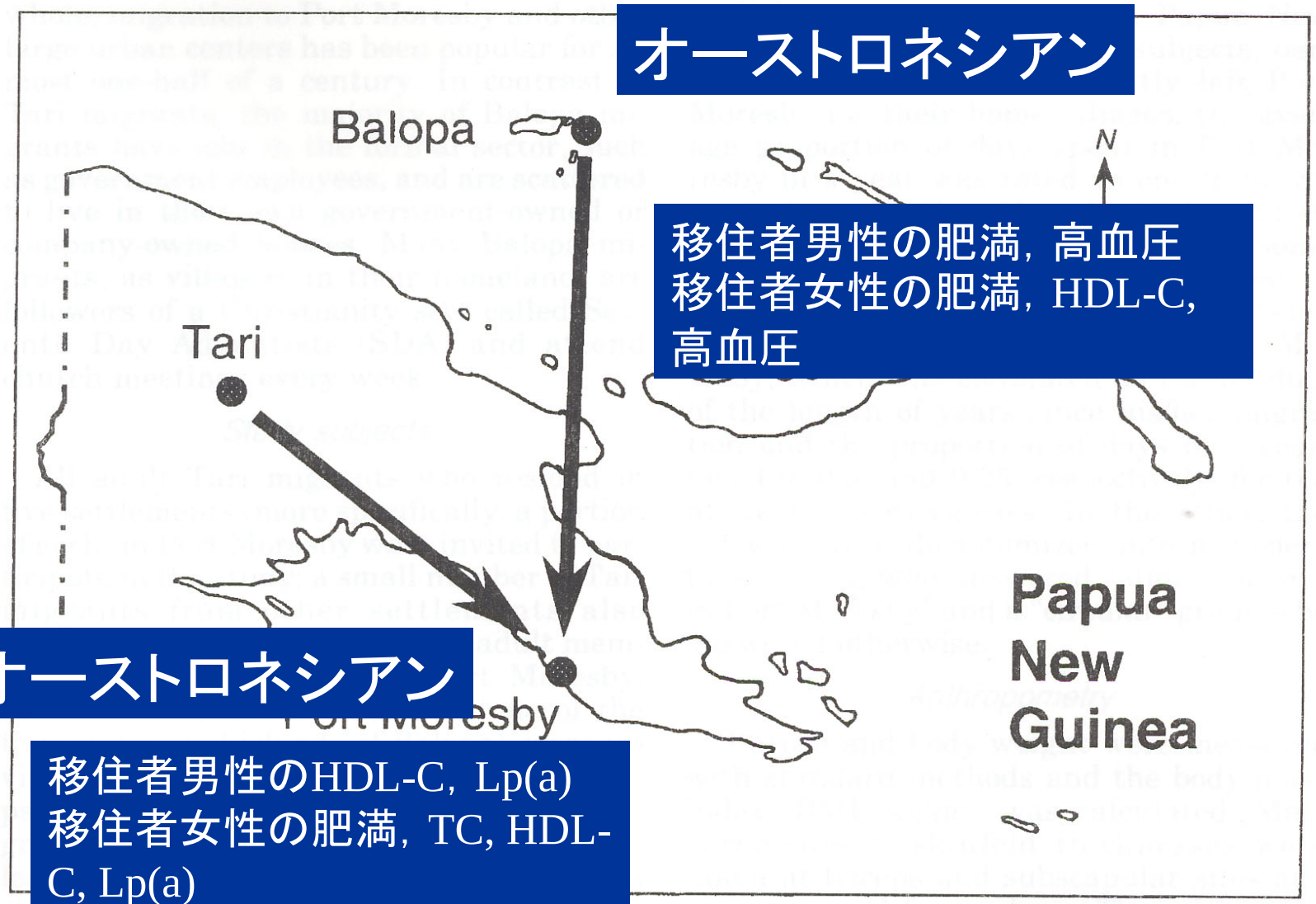


Fig. 1. Location of Port Moresby and homelands of Balopa and Tari migrants.

人類の直面する問題へのフィールドワークの寄与

事例（５）：都市のスラムは撤去すべきか

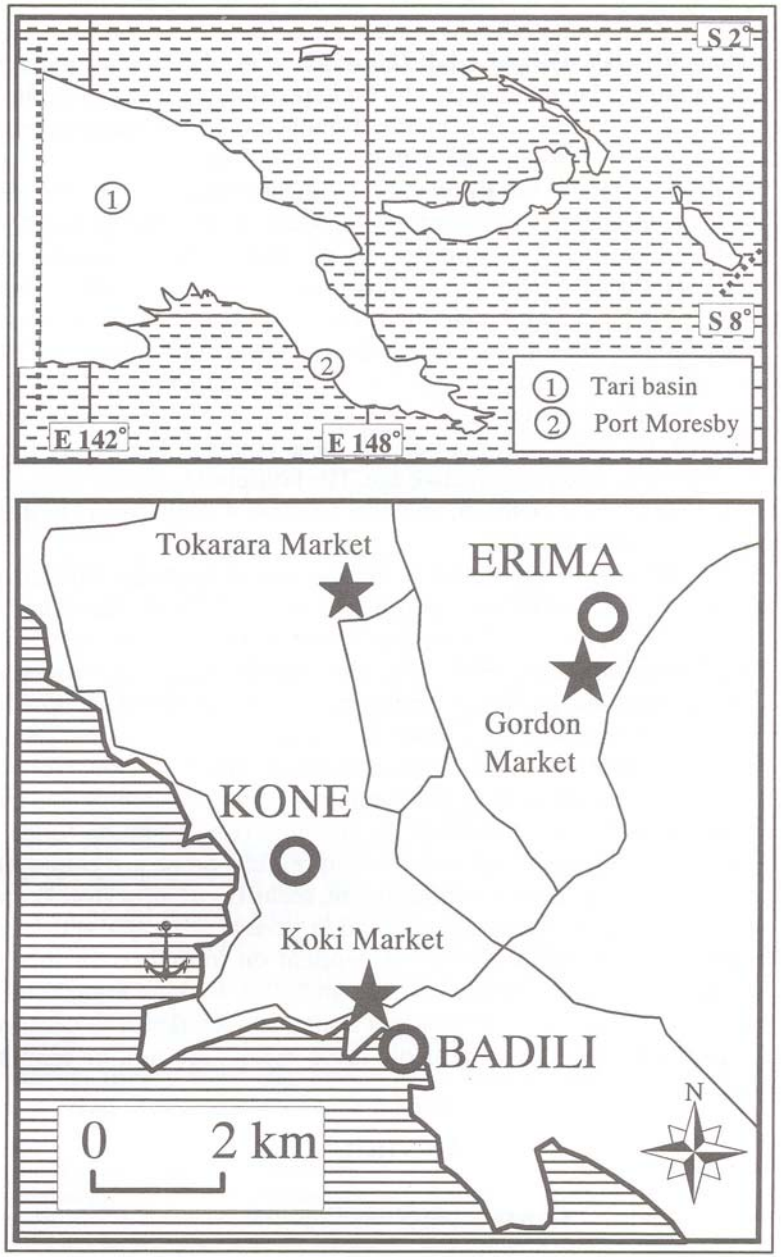


Fig. 1. Location of the Tari basin and the national capital of Port Moresby (upper), and location of the subject settlements and major markets in Port Moresby (lower).

Adaptive Strategies of Highlands-Origin Migrant Settlers in Port Moresby, Papua New Guinea

Masahiro Umezaki[1,2,3] **and Ryutaro Ohtsuka**[1]

This study examined adaptive strategies of Huli-speaking migrants from the Tari Basin in the Southern Highlands Province to Port Moresby, the capital of Papua New Guinea. An interview survey of all migrant dwellers in two Huli communities, and time allocation and food consumption studies in their three primary settlements revealed that the subject households relied for their livelihood on a variety of activities in the informal sector (e.g., vending, small-scale retailing, moneylending, and chicken rearing) and jobs in the formal sector (e.g., driver, public servant, security guard, and storekeeper). Unexpectedly, the average income of households that exclusively depended on informal sector jobs was equivalent to, or higher than, that of households which included an employee in the formal sector. In addition, the average working hours were shorter in the former. Large interhousehold variation characterized the sample. The residential environment and composition of each household influenced economic strategies, which in turn determined the income, labor hours, and labor efficiency. However, food and nutrient intakes did not vary widely because leveling mechanisms among households, which are social norms in their homeland, still function in the urban settlements. The roles of settlements in Port Moresby are also discussed in relation to "urban problems" and rural-urban connections.

KEY WORDS: rural–urban migration; informal sector; interhousehold variation; leveling mechanisms; Port Moresby, Papua New Guinea.

Genealogical charts in rural communities

54 migrants in port Moresby

N=54

Table I. Place of Residence, Sex, and Marital Status of the 54 Huli Migrants

	Place of residence				% Individuals employed in the formal sector
	Urban areas[a]		Settlements and urban villages[a]		
	Married	Single	Married	Single	
Male	7	2	6	16	23
Female	8	2	6	7	9
Total	15	4	12	23	17

Note. The 54 migrants were listed in the genealogical charts for Wenani and Heli communities in the Tari basin. See text for details.

[a] According to the definition by the National Census Bureau of Papua New Guinea.

Table II. Characteristics of the 23 Households of the Huli Migrants in Port Moresby

		Number per household				
	Total	Mean	*SD*	Median	Maximum	Minimum
Family members (parents and children)	114	5.0	2.7	5	11	1
Cohabitants (single)	111	4.8	4.3	3	15	0
Cohabitants (ever-married)	35	1.5	2.4	1	9	0
% Households located in settlements	48					
% Pipe-water-equipped	91					
% Electricity-equipped	65					

Table III. The Number of Economic Activities Reported by the 260 Huli Migrants of 23 Households

Informal sector	
Selling	
Betel nut/cigarettes	6
Egg	5
Meat	3
Scone	1
Onion/potato	1
Chocolate	1
Store owner	8
Storekeeper	4
Billiard table owner	3
Beer retailer	3
Bottle collector	2
Moneylending	2
Video screener	1
Contract worker	1
Part-time paperworker	1
Formal sector	
Public servant	4
Regional member	1
Preacher	1
Company employee	
Security guard	13
Driver	3
Factory worker	2
Electrician	1
Hotel worker	1
Carpenter	1
Total	69

Table V. Economic Activities Conducted by Eight Huli Households in the Three Settlements

Activities	Settlements/households							
	Badili			Kone			Erima	
	A	B	C	D	E	F	G	H
Informal sector								
Selling								
Betel nuts	●				○	●	○	○
Cigarettes	○				○	○	○	
Fried fish				○				
Fried lamb							○	
Ice blocks							○	
Cigarette (called Mutrus)	○					○	○	
Scones		●		○				
Small-scale retailing				○			○	
Beer retailing				●			●	
Money lending	○	○					○	
Chicken rearing				○			○	
Rental billiard tables							○	
Formal sector								
Policeman			●					
Driver					●			
Carpenter		○						●

● : Activity from which the household earned the largest amount of money during the study period.

○ : Other activities conducted during the study period.

Table VI. Activity Type-Based Cost-Profit Relations, Based on the Time Allocation and Household Economic Surveys for the Eight Households

Activities	Observation unit (days)	*n*	Total observation days	Mean					
				Prime cost	Other cost	Gross earnings	Net earnings	Gross earnings/ total cost	Net earnings/ day
Informal sector									
Selling									
Betel nuts	1–2	26	34	12.5 (19.8)[a]	0.7 (0.5)[a]	18.7 (24.1)[a]	5.5 (6.1)[a]	1.6 (0.4)[a]	4.3 (4.7)[a]
Other items	1–3	25	52	14.6 (15.7)[a]	0.3 (0.6)[a]	21.9 (21.9)[a]	7.0 (6.5)[a]	1.7 (0.6)[a]	3.7 (3.5)[a]
Scone selling	1–2	7	15	19.9 (12.9)[a]	0.4 (1.0)[a]	65.6 (43.3)[a]	45.2 (32.7)[a]	3.4 (1.1)[a]	20.8 (12.6)[a]
Beer retailing	7	2	14	1575.3 (1240–1910)[b]	54 (6–102)[b]	2041.9 (1680–2403)[b]	412.6 (338–487)[b]	1.3 (1.3–1.3)[b]	58.9 (48.3–69.6)[b]
Moneylending	7	1	7	100	0	130	30	1.3	4.3
Chicken rearing	60	1	60	470.6	0	1000	529.4	2.1	8.8
Formal sector	7	3	21	—	—		252 (60–125)[b]		12 (8.7–17.9)[b]

Note. Days required for one observation ranged from 1 (betel nuts that were bought in the morning were sold out in a day) to 60 (chicken rearing, from buying chicks to having sold out all chickens). *n* is the number of observation cycles. Prime cost included money for buying items for selling or retailing, for moneylending, and money for buying chicks for chicken rearing, while other cost included cost of transportation and buying equipment. Gross earning minus total cost is net earnings. For each activity, the ratio of gross earnings to total cost and net earnings per day were calculated as indexes of efficiency.

[a] mean and *SD*.

[b] Mean and range.

Table VII. Household-Based Cost-Profits, and Energy and Nutrient Intakes for the Eight Households

	Households/economic activities										
	Betel nuts		Scone	Waged works			Beer				
	A	F	B	C	E	H	D	G	Mean	*SD*	CV (%)
Number of adults (15 years or older)	2	2	4	3	3	4	5	5			
Number of nonadults	3	1	2	1	2	4	1	4			
Total consumption unit (CU)	3.2	2.4	4.8	3.4	3.7	5.9	5.2	5.9			
Per adult weekly labor hours (h)	38.5	41.5	36.5	17.7	46.0	8.8	12.8	17.2	27.4	14.7	53.7
Net earnings per working hour (kina/h)	1.5	1.5	2.2	1.3	1.1	1.1	6.6	6.8	2.8	2.5	89.2
Per adult net earnings in a week (kina)	57.8	61.0	82.1	22.5	49.8	9.4	83.9	117.2	60.5	34.7	57.3
Per CU net earnings in a week (kina)	36.1	50.8	68.4	19.9	40.4	6.4	80.6	99.3	50.2	31.2	62.1
Per CU expense for foods (kina)	28.9	16.5	17.1	25.1	19.4	16.1	24.6	25.7	21.7	5.0	22.9
Energy intake (kcal)[a]	2744	2092	2423	2241	2455	2218	2429	2661	2408.0	221.6	9.2
Protein intake (g)[a]	91	62	67	69	69	59	79	74	71.1	10.2	14.4
Fat intake (g)[a]	101	33	78	75	61	61	89	79	72.2	20.6	28.6

Note. Significant correlation was found between per adult net earnings in a week and per CU net earnings in a week (Pearson's correlation coefficient, $r = 0.98$, $p < 0.001$). While correlations were found between per CU expense for foods and nutritional intakes ($r = 0.71$, $p = 0.049$, for energy; $r = 0.87$, $p = 0.005$, for protein; and $r = 0.78$, $p = 0.023$, for fat), no correlations were found between per CU net earnings in a week and per CU expense for foods ($r = 0.24$, $p = 0.56$), nor between per CU net earnings in a week and nutritional intakes ($r = 0.44$, $p = 0.27$, for energy; $r = 0.30$, $p = 0.48$, for protein; and $r = 0.23$, $p = 0.58$, for fat).

[a] 1 kcal = 4.184 kJ. An adult male with average body weight (72.6 kg) was defined as 1.0 consumption unit (CU) and each individual was assigned a relative ratio on the basis of his/her energy requirement (FAO/WHO/UNU, 1985). Intakes of energy, protein and fat are adjusted to the value per CU.

Large variation of income levels among households
Small variation of food consumption

Norms that stem from rural society:

- Rich people are supposed to spend more money to maintain tie with rural people
- Rich people are supposed to feed more people

Urban settlements as a safety net of population pressure rural areas

人類の直面する問題へのフィールドワークの寄与

事例（6）：Gender の問題

TIME ALLOCATION TO SUBSISTENCE ACTIVITIES AMONG THE HULI IN RURAL AND URBAN PAPUA NEW GUINEA

MASAHIRO UMEZAKI, TARO YAMAUCHI AND RYUTARO OHTSUKA

Department of Human Ecology, School of International Health, Graduate School of Medicine, University of Tokyo

Summary. Time spent on subsistence activities was compared between rural sedentes and urban migrants of the Huli population in Papua New Guinea. Person-day observation data were collected for rural sedentes (441) in the Tari basin and for urban migrants in Port Moresby (175). The time spent on subsistence activities by males was longer in the urban area than in rural areas, while that by females was similar in both areas. Conspicuous gender inequality with respect to labour hours in rural areas seems to diminish when people move to urban areas, reflecting the different subsistence regime between rural and urban environments.

Table IV. Daily Time Allocation (in Hours) of the Subject Adults (15 Years or Older) by Sex

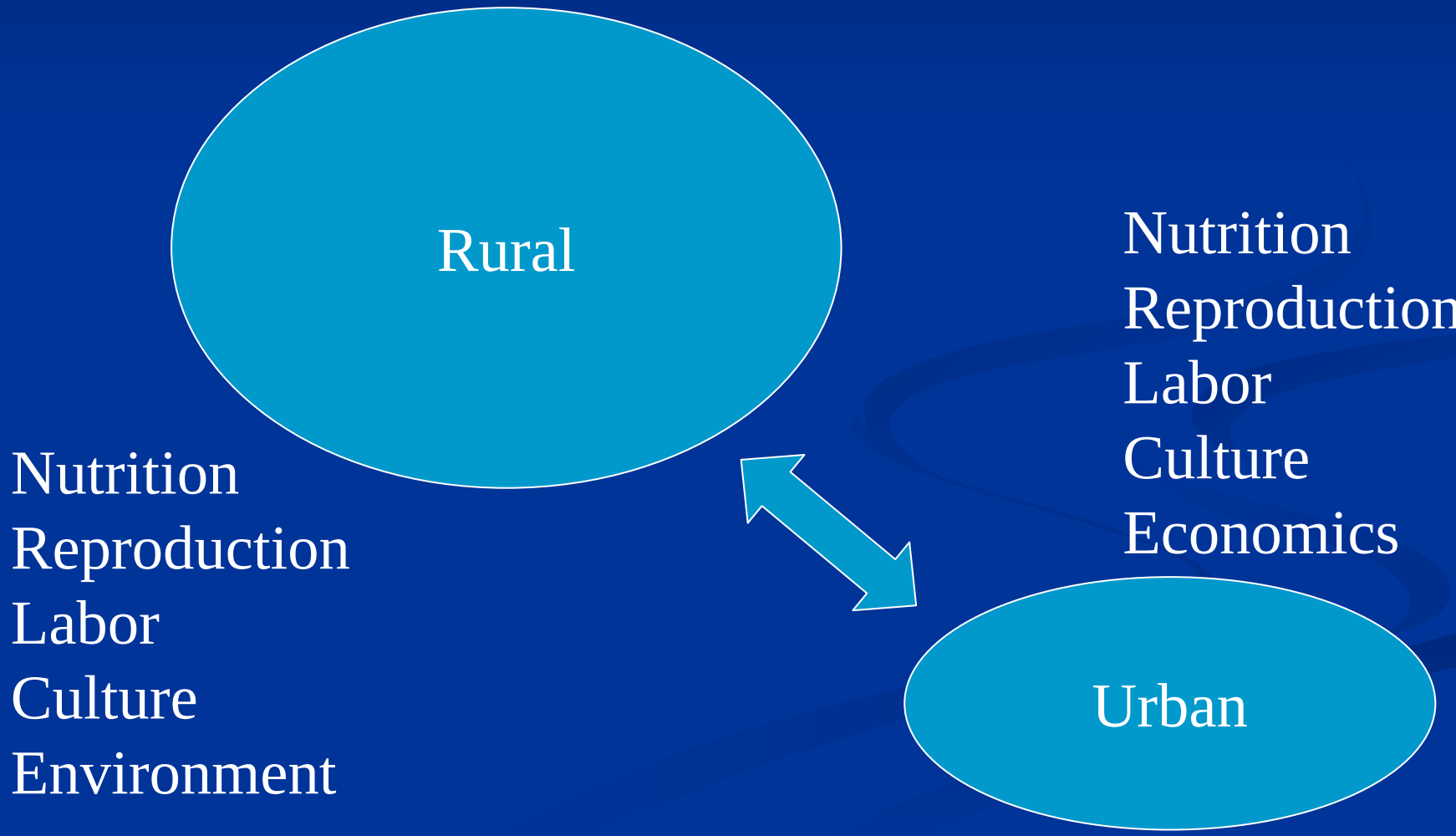
Activities	Male ($n = 13$)	Female ($n = 12$)
Economic activities	3.6	4.3
Job hunting	0.8	0.0
Preparing food	0.1	1.0
Eating	0.4	0.6
Washing	0.1	0.6
Resting/idle	4.2	5.3
Sleeping	7.8	8.7
Drinking beer	1.1	0.0
Leisure	1.0	0.2
Church activities	0.2	0.3
Schooling	0.3	0.0
Visiting hospital/clinic	0.0	0.2
Shopping	0.1	0.4
Visiting friends	3.8	1.8
Miscellaneous	0.5	0.6

Table 1. Time spent on subsistence activities by rural and urban subjects by activity category and sex (in hours)

	Rural sedentes		Urban migrants	
	Male	Female	Male	Female
n	24	53	13	12
Person-days	134	307	91	84
Subsistence activity				
Horticulture	1·66 (1·76)	3·95 (1·48)		
Constructing ditches and pig sties	0·75 (1·30)	0·00 (0·04)		
Pig rearing	0·32 (0·42)	0·32 (0·44)		
Collecting wild plants, fishing and hunting	0·06 (0·21)	0·21 (0·92)		
Informal sector			1·71 (2·11)	4·30 (2·53)
Paid job			1·89 (3·51)	0·00 —
Job hunting			0·85 (2·04)	0·00 —
Total	2·79 (2·17)	4·50 (1·42)	4·45 (3·47)	4·30 (2·53)

Standard deviations are shown in parentheses. Total time spent on subsistence was: different between males and females of the rural sedentes with statistical significance (Wilcoxon test, $p=0·0007$); different between rural and urban males with marginal significance (t-test, $p=0·09$). No significant difference was found between males and females of the urban migrants or between rural and urban females. Appropriate statistical tests were used based on the results of the Shapiro–Wilk W test (test of normality) and the test of equal variances.

Human Ecology= holistic approach =human nature



2. Fundamental Questions

1. International aid is really justifiable?
2. Human or *Homo sapience*?
3. Birth is good and death is bad?

"Ethnocentrism"

International aid is to help the people who have insufficient understanding or ability to cope with their problem. Bad habits (eating raw pork, too much drinking liquor) will cause health problems to the people, so they should be stopped.

"Cultural relativism"

Each society has its own culture and adaptation system. Even the habits that seems inappropriate for the external people have their own logic in each society.
We should understand the uniqueness of culture and avoid intervention from outside.

Each society has its own culture. Even the habits that seems inappropriate for the external people have their own logic in each society.

However, ignorance of such problems will contribute to the maintenance of current economic inequality in the world.

We need objective or scientific understanding of the problems in the context of each society.

Table II. Changes in Garden Size, Number of Mounds by Growth Stage, and Cultivation Cycle During the Normal Period in 1993 and the Extended Rainy Period in 1994

	Wenani[a]				Heli[a]	
	1993		1994–1995		1994	
	Sept.	Nov.	Nov.	Jan.	Oct.	Dec.
Gardens under cultivation (m^2)	187,540	194,650	168,670	177,040	87,520	97,390
Number of mounds in Stage A[b]	13,385	14,156	12,075	12,983	5,606	4,662
Number of mounds in Stage B[b]	7,095	7,388	7,004	6,857	4,349	6,319
% of mounds in Stage A	65%	66%	63%	65%	56%	42%
Initially harvested mounds[c]/ day/ha	2.9		4.7		5	
Finally harvested mounds[c]/ day/ha	2.6		4.7		1.9	
Newly made (planted) mounds/day/ha	3.9		5.3		3.5	

[a]Mean interval between observations was 43.9 days in 1993 and 86.3 days in 1994–1995 in Wenani and 71.0 days in Heli in 1994.

[b]Stage A, from planting to first harvest; Stage B, from first harvest to final harvest.

[c]Harvesting starts about 6 months from planting and continues for several months until the mounds are broken. "Intially harvested" refers to the first harvest since planting, and "finally harvested" to the final harvest by breaking mounds.