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POPULATION PRESSURE AND MIGRATION: IMPLICATIONS FOR UPLAND DEVELOPMENT IN THE PHILIPPINES*

*Ma. Concepcion J. Cruz, Imelda Zosa-Feranil and Cristela L. Goce***

I. Introduction

The present trend of increasing population pressure on the forest resources of many developing countries and the projections up to the beginning of the next century both indicate a crisis. Warding off this crisis shall require action to be taken on a scale far greater than currently provided for or imagined.

The major breakthrough in policy should be the proper recognition of the upland population issue as "critical" or one that needs to be addressed directly and swiftly. The adoption of a realistic and comparative population base figure is the initial step toward a comprehensive policy for forest resources development. This paper discusses the role of population pressure and migration in Philippine upland development. It is based on a study which was completed in August 1986 by the Center for Policy and Development Studies of the University of the Philippines at Los Baños (CPDS-UPLB) and funded by the Philippine Institute for Development Studies (PIDS) and the International Development Research Centre (IDRC). The complete report and a detailed description of the study is found in Cruz, Zosa-Feranil and Goce (1986).

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**Assistant Professor and Head, Environmental Education Division, Institute of Environmental Science and Management (IESAM), University of the Philippines at Los Baños (UPLB); Assistant Professor, University of the Philippines Population Institute; and former Instructor, Department of Economics, College of Economics and Management (CEM), University of the Philippines at Los Baños, respectively.

Three levels of analysis, using combined macro and micro data, make up the different phases of the study. The first phase involved the identification of upland sites using available topographic maps and serial photographs. Population figures were then estimated from the 1980 Census of Population. The description of the results of this first phase is provided in Part II.

The second phase focused on the major migration streams identified from the Census. A preliminary analysis of migration from lowland to upland areas was first conducted by estimating net migration at the regional, provincial, and municipal levels. Then, three types of macro migration models, using multiple regression were constructed to evaluate the macro-level determinants of upland population movements. Part III summarizes the results of this phase.

In the third phase, upland migration is analyzed from the perspective of micro, village-level information. Three villages in an upland area (Mount Makiling watershed) were used to evaluate circumstances of movement, frequency and mode of travel, and the socioeconomic correlates of migrant behavior such as income, occupation, ownership status, education, and others. The case study results are presented in Part IV.

Such a comprehensive approach was useful in several ways. First, it allowed the important characteristics of migration, which were not included in the national census information, to be incorporated in the analysis. Second, the aggregate models provided the broad perspective of population movements which were generally difficult to ascertain from a limited case study approach. Lastly, a third advantage was the policy usefulness generated from combining macro and micro migration information, the former providing general, national trends of upland migration and the latter giving specific insights on particular circumstances and effects of movement.

II. Philippine Upland Population

Using the 1980 Census, the study estimated the upland population at 14.4 million persons (see Table 1). Until that time, very few people cared to hazard a documented estimate (although there were several "guesstimates" floating around). The large population estimate contrasts with the data on "detected cases of squatting" in the uplands of the Bureau of Forest Development (BFD) which uses the figure of 1.3 million persons in 1980 (BFD, 1982).

Using upland population growth trends for the period 1975 to 1980 as basis, the upland population will decline by 5 percent every 10 years. The present upland population would then be 17.8 million of which almost one-half (48 percent) or 8.5 million persons occupy forestlands which are part of

Table 1
NUMBER OF PROVINCES AND MUNICIPALITIES WITH UPLAND AREAS AND TOTAL POPULATION OF AREAS CLASSIFIED AS UPLAND (1980)

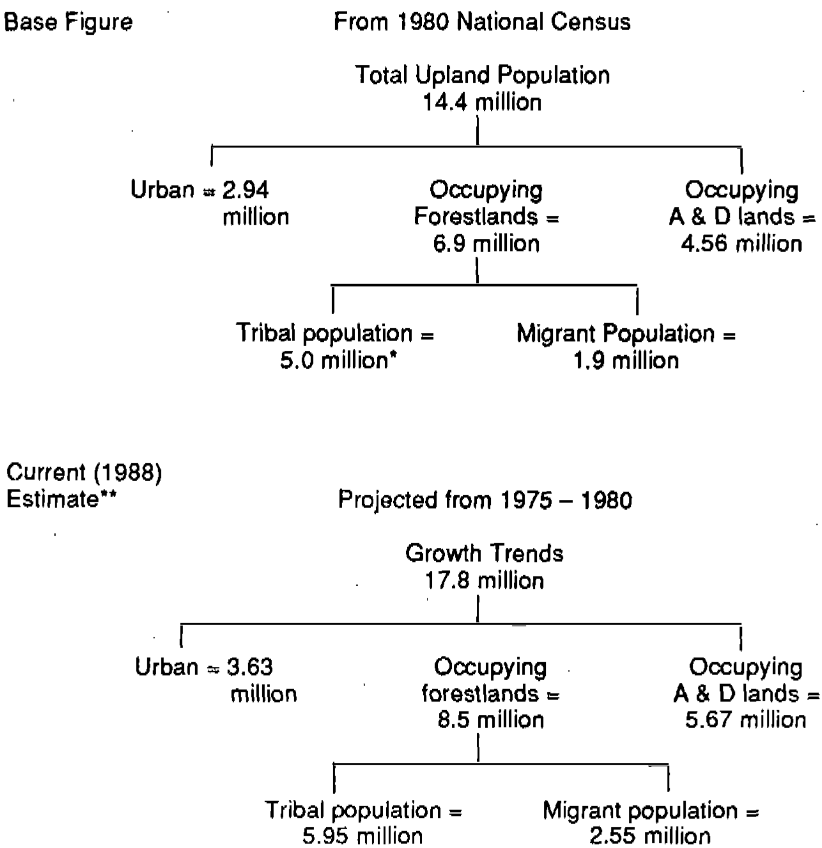
Region	Number of Provinces	Number of Municipalities	Total Population as of 1980[a]
I. Ilocos	7	115	1,445,522
II. Cagayan	7	67	1,129,268
III. Central Luzon	6	34	843,611
IV. Southern Tagalog	10	72	1,299,226
V. Bicol	5	50	1,059,419
VI. Western Visayas	5	61	1,477,525
VII. Central Visayas	3	72	1,839,817
VIII. Eastern Visayas	5	53	944,817
IX. Western Mindanao	3	28	569,605
X. Northern Mindanao	6	55	1,254,448
XI. Southern Mindanao	5	68	1,833,747
XII. Central Mindanao	5	34	743,083
Total Upland	67	709	14,440,088
Total Philippines	73	1,505	48,098,460
Percent of Total Population	92	48	30

[a] Derived from municipal population data.
Source: Cruz, Zosa-Feranil and Goce (1986). Values derived from the National Census and Statistics Office, published census for 1980.

the public domain (Cruz and Zosa-Feranil, 1988). A significant 30 percent of forestland population (2.55 million) are migrants who have little experience with farming on steep slopes (see Figure 1).

The Philippine government defines *upland* as comprising: (1) marginal lands with slopes 18 percent or higher, (2) lands within identified mountain zones including table lands and plateaus lying at high elevations, and (3) lands within terrain classified as hilly to mountainous (BFD, 1982). Around 14.9 million hectares or one-half of the entire country's land area are classified as upland. Over 57 percent of the upland area (or 8.5 million hectares) is suitable for agriculture based on a simple slope classification defining the limits of upland agriculture as 30 percent slope and above.

Figure 1
ESTIMATED UPLAND AND FORESTLAND POPULATION, 1980 AND 1988



* based on estimates provided by DENR (1986)
** assumes from 1975-1980 growth rates that the upland population will decline by 5 percent every 10 years.

1. *Estimating Upland Population*

There are at least three reasons for undertaking a systematic analysis of upland population movements. The first has to do with the significance (in both actual number and proportion) of the growing population of upland dwellers in the country. The current upland population of 17.8 million represents 30 percent of the total population of 58 million. The annual population growth rate for the period 1948 to 1980 is 2.5 percent which means that if such a rate were to continue, population in the uplands would double in 25 years.

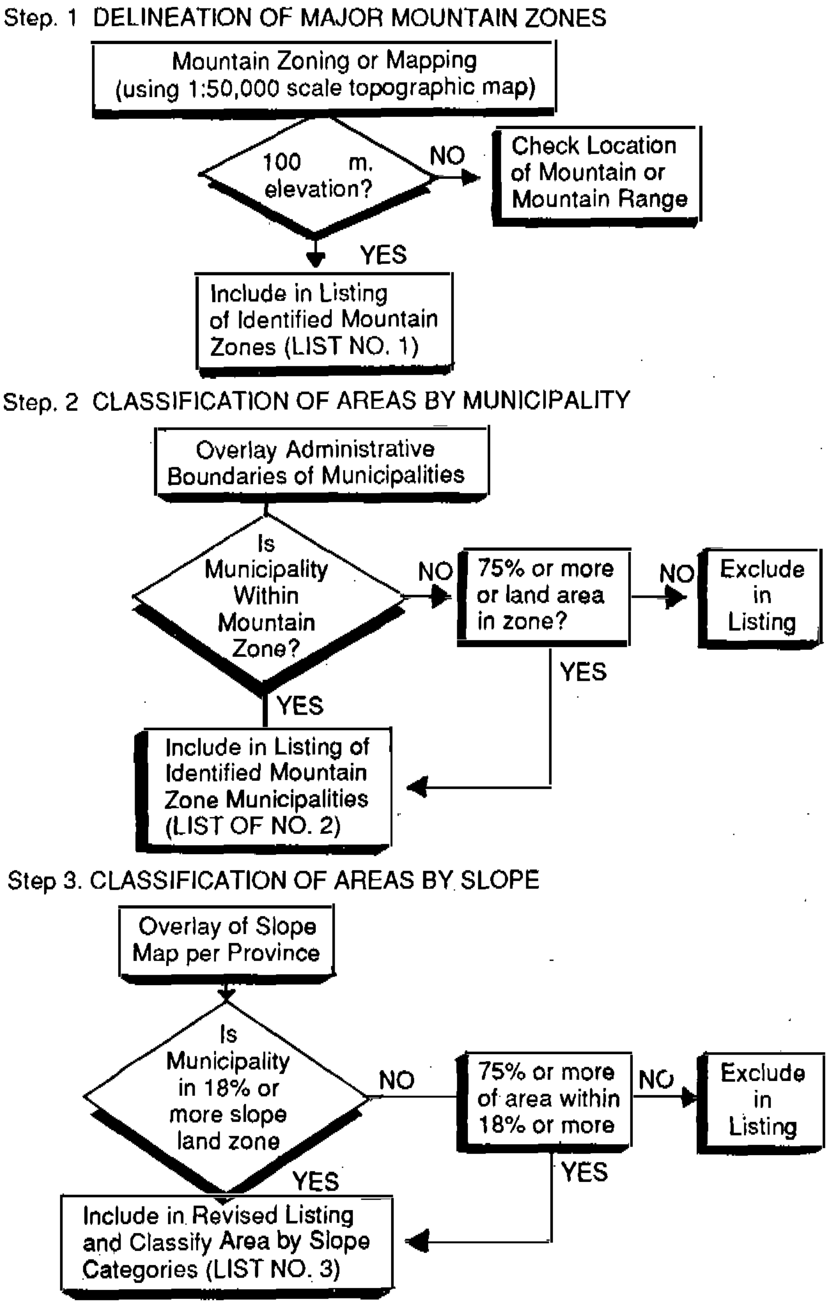
The second reason is the urgency of resolving the critical problems associated with population stress on forest resources. A greater demand for enforcing effective conservation and forest protection policies is needed especially if movement into easily erodable and critical watershed sites is left uncontrolled. In addition, man-to-land ratios increase rapidly with in-migration. Migrant settlers often use farming techniques different from those suited for upland cultivation, leading to such destructive effects as increased erosion, silting and clogging of waterways downstream.

The third reason for arriving at a good population estimate for the uplands is the need to address current problems of low income and poverty. Upland residents have been found to be among the "poorest of the poor" with annual per capita incomes of ₱2,168 ($108), which is way below the average poverty cut-off for families belonging to the bottom 30 percent income bracket (Quisumbing and Cruz, 1986; Cruz, *et al.*, 1987). As of the third quarter of 1983, the poverty incidence rate in forestry and forest-based occupations was 47 percent, which is significantly higher than the 43 percent poverty incidence rate for lowland rice and corn farmers.

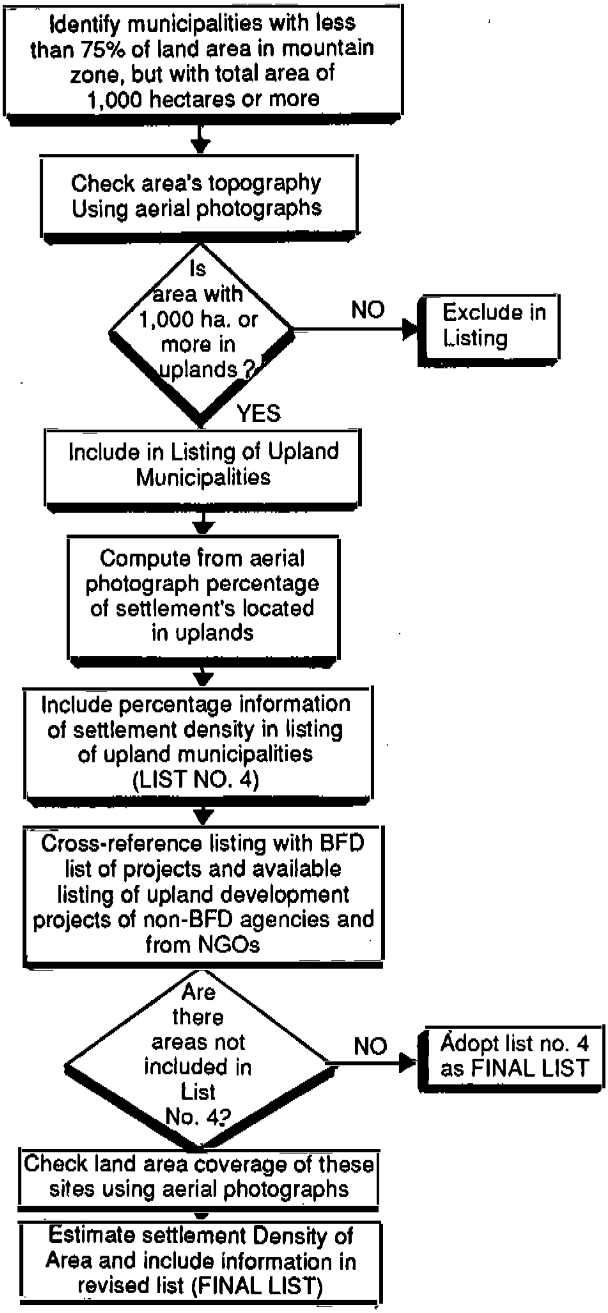
It is extremely difficult to estimate upland population because administrative boundaries of municipalities do not correspond with the government's definition of upland. Nonetheless, Figure 2 specifies a step-by-step procedure for obtaining an adjusted population count using a settlement density factor (SDF) based on aerial photographs. The SDF is the ratio of the number of dwellings within an upland boundary relative to the total number of dwellings in the municipality. This is then used as an index of the number of residents within the upland area.

For example, areas lying entirely within a mountain zone receive an SDF value of 1.0 while municipalities with one-third of houses located in the uplands receive an SDF value of 0.33. Municipalities with 75 percent or more of land area lying within an upland boundary are considered in the population count. As a final step, the SDF figure is then applied to the census population figure to adjust for the actual population residing in the upland portion of the municipality. Based on this procedure, there are 302 municipalities in 60 provinces which can then be classified as upland,

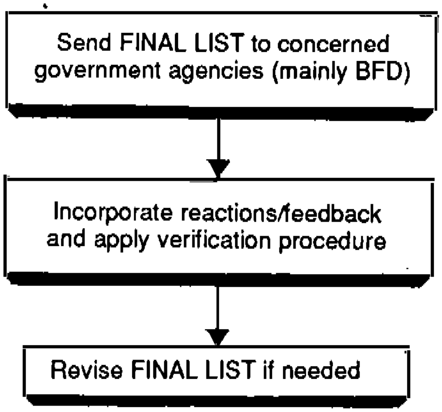
Figure 2
IDENTIFICATION PROCEDURE FOR DELINEATING UPLAND SITES



Step 4. TWO-STAGE VERIFICATION



Step 5. VALIDATION AND FEEDBACK



representing 48 percent of the entire listing of municipalities in the Philippines (see Table 1).

Table 2 contains upland population estimates for the period 1948 to 1980. The period of rapid growth in upland population occurred in the years 1960 to 1970, at an average of 3.09 percent per year. Although the upland population growth rate gradually declined in the succeeding years (2.5 percent per year), population size has grown steadily.

The attractiveness of upland sites varies markedly across the 12 regions of the Philippines, with density levels ranging from 61 persons/square kilometer in the Cagayan Valley region to 280 persons/square kilometer in Central Visayas (see Table 3). The highlands of Cagayan Valley, Southern Tagalog, and Southern Mindanao comprise 45 percent of the total uplands but their combined population accounts for only 20 percent of the total upland population for the years 1948 to 1980. Meanwhile, the regions of Central and Western Visayas, which represent 10 percent of the total upland population, comprise only 5 percent of total land area classified as upland.

The average population density for all upland areas was 39 persons/square kilometer in 1948. This increased dramatically to 74 persons/square kilometer in 1970 and then rose sharply to 119 persons/square kilometer in 1988. Some areas exhibit rapid increases in population due to the very large influx of migrants. The proximity of the province of Laguna to Metropolitan Manila, for example, partly explains the doubling of population in its upland in the period 1960 to 1975 when resettlement from crowded urban centers accelerated.

Table 2
UPLAND POPULATION REGION, 1948-1988

Region	1948	1960	1970	1975	1980	1988*
PHILIPPINES	**5867586**	**8190012**	**11108731**	**12703070**	**14440088**	**17835118**
I. Ilocos	755878	973245	1205127	1317257	1445522	1677784
II. Cagayan	402065	591987	832473	971231	1129268	1437203
III. Central Luzon	284968	408994	633034	742182	843611	1035907
IV. Southern Tagalog	422012	665626	957965	1129221	1299226	1659935
V. Bicol	496408	740710	916094	987626	1059419	1184988
VI. Western Visayas	860566	1068708	1178576	1362450	1477525	1681552
VII. Central Visayas	1035154	1216953	1462250	1639949	1839817	2212068
VIII. Eastern Visayas	566555	659191	794222	863411	944817	1091472
IX. Western Mindanao	198936	274666	422081	460556	569605	800166
X. Northern Mindanao	384123	553919	875480	1047295	1254448	1674991
XI. Southern Mindanao	308713	688510	1224869	1503734	1833747	259278
XII. Central Mindanao	152208	347503	606560	678158	743083	859774

Basic source of data: Cruz, Zosa-Feranil and Goce (1986).

* Estimated population for 1988 based on population projections from the 1975-80 level. The estimates assume that population in various regions will decline from the 1975-80 level by 5 percent every 10 years.

Table 3
UPLAND LAND AREA AND POPULATION DENSITY BY REGION, 1948-1988*

Region	*Land Area (sq. km.)*	*1948*	*1960*	*1970*	*1975*	*1980*	*1988*
PHILIPPINES	**149698.7**	**39**	**55**	**74**	**85**	**96**	**119**
I. Ilocos	15121.5	50	64	80	87	96	111
II. Cagayan	23437.3	17	25	36	41	48	61
III. Central Luzon	6118.9	47	67	103	121	138	169
IV. Southern Tagalog	23062.4	18	29	42	49	56	72
V. Bicol	7187.6	69	103	127	137	147	165
VI. Western Visayas	10079.5	85	106	117	135	147	167
VII. Central Visayas	7891.6	131	154	185	208	233	280
VIII. Eastern Visayas	8537.6	66	77	93	101	111	128
IX. Western Mindanao	5520.3	36	50	76	83	103	145
X. Northern Mindanao	11761.9	33	47	74	89	107	142
XI. Southern Mindanao	21281.7	15	32	58	70	86	118
XII. Central Mindanao	9699.2	16	36	63	70	77	89

* Density measured as number of persons per square kilometer.
Basic source of data: Cruz, Zosa-Feranil and Goce (1986).

2. *Dependency Ratio*

Over 43 percent of the upland population are in the young age bracket of 0-14 years, while 54 percent are of working age (15-64 years). Such an age distribution indicates a relatively high dependency burden as the figures in Table 4 show. On the regional and provincial levels, dependency ratios do not vary significantly except for a few areas with a very high dependency burden. These areas are found mostly in the Bicol region with dependency figures larger than 200.

Table 4
DEPENDENCY RATIOS AND FOREST COVER (IN SQ. KM.) VARIABLES

Dependency Level 1980	*Percent Age 15-64 Years*	*Density Level 1975*	*1975*		*Density Level 1980*	*1984*	
			Total Forest Land	*Alienable & Disposable Land*		*Total Forest Land*	*Alienable & Disposable Land*
High Dependency (190 or more)							
Bicol	49	137	5,561 (32)	12,071 (68)	147	5,500 (31)	12,100 (69)
Eastern Visayas	52	101	11,929 (56)	9,502 (44)	111	10,600 (50)	10,800 (50)
Central Mindanao	52	70	18,310 (63)	10,696 (37)	77	14,000 (60)	9,400 (40)
Western Visayas	53	135	7,032 (35)	12,190 (65)	147	6,500 (32)	12,700 (68)
Moderate Dependency (185-189)							
Southern Tagalog	53	49	28,890 (61)	18,623 (39)	56	27,900 (59)	19,600 (41)
Southern Mindanao	53	70	16,356 (60)	10,970 (40)	86	20,100 (64)	11,500 (36)
Cagayan	54	41	26,253 (72)	10,150 (28)	48	26,200 (72)	10,300 (28)
Western Mindanao	54	83	10,108 (54)	8,578 (46)	103	9,900 (53)	8,700 (47)
Low Dependency (<185)							
Ilocos	55	87	12,507 (57)	9,620 (43)	96	12,400 (58)	9,100 (42)
Central Visayas	55	208	6,903 (46)	8,049 (54)	233	6,700 (45)	8,200 (55)
Central Luzon	55	121	8,102 (44)	10,175 (56)	138	8,100 (44)	10,300 (56)
Northern Mindanao	56	89	18,344 (65)	9,983 (35)	107	18,100 (64)	10,300 (36)

Source: Cruz, Zosa-Feranil and Goce (1986), Table 3.16, p. 67.
Note: All numbers in parentheses are percentages.

Around 39 municipalities can be characterized as "critical" areas — that is, having a very high dependency burden and located in easily erodable sites, with average slopes of 30 percent or higher. In these areas the need to exploit forest resources is so great that carrying capacity limits are reached much earlier than in other sites (refer to Table 4).

III. Determinants of Upland Migration

The adjusted migration figures in Table 5 represent the proportion of the total migrant population moving to the uplands for the period 1975 to

Table 5
MIGRATION TO UPLAND AREAS, 1975-1980

	Intra-Regional	*Inter-Regional*		
Region	*Migrants to Upland Areas from Other Provinces of the Same Region*	*In-Migrants to Upland Areas from Other Regions*	*Total Out-Migrants Lost to Upland Areas in Other Regions*	*Regional Upland Net Migration*
I. Ilocos	14657	17279	18017	–738
II. Cagayan	8680	17670	8912	8758
III. Central Luzon	5855	17792	15775	2017
IV. Southern Tagalog	11361	40216	12101	28115
V. Bicol	5684	11094	13487	–2393
VI. Western Visayas	6644	9951	23934	–13983
VII. Central Visayas	4959	20332	39950	– 19618
VIII. Eastern Visayas	2860	10056	18985	–8929
IX. Western Mindanao	2881	8354	14668	– 6314
X. Northern Mindanao	21781	48228	23088	25140
XI. Southern Mindanao	23653	47120	21863	25257
XII. Central Mindanao	5247	26195	16147	10048

Source: Cruz, Zosa-Feranil and Goce (1986), Table 3.22, p. 77.

1980. Since migration data during intercensal years are not available, the figures are likely to be underestimated.

After 1948, two general migration patterns may be observed. The first pattern from the early postwar years up to 1960, is the movement of people from the Visayas regions to the frontier lands of Mindanao. The second wave of migration occurred after 1960, and is the predominantly urbanward movement although sizeable migration also occurred in many upland areas (Perez, 1978). In fact, in the early seventies, some 47,000 migrants moved to the uplands of Southern Tagalog and Central Luzon from the urban centers of Metropolitan Manila.

Overall, the largest net migration to upland areas occurred in lands with relatively low population density. There was a moderately low dependency level in some regions so that the potential for absorbing new migrants was much larger compared to the relatively populated areas. This was the case for Southern Tagalog and Southern Mindanao before 1970, but as population increased in these regions there was a substantial drop in in-migration during the succeeding years.

The general pattern of movements across regions is characterized by long distance travel which is selective of age and sex. The early-period migrants (postwar up to 1960) tended to be young and males. For example, 65 percent of total migrants to the uplands in Northern Mindanao were males between 20 and 34 years of age (Wernstedt and Simkins, 1965). Migration in the later period (after 1960) was still dominated by males, but these tended to be older (45-54 years). These later migrants also travelled much longer distances, originating from various places and often crossing major island groupings. A significant percentage of females (80 percent of lifetime migrants in 1975) was observed to have constituted the second-wave movements following the earlier young, male-dominated migration streams once more established routes were set. Such a two-stage pattern of movement prevailed throughout the country, regardless of areas of origin and destination.

The presence of relatives and friends in destination areas served as a significant inducement for movement. Especially among young migrants, distance did not serve as a deterrent to movement as long as there was ethnic similarity in the place of destination. The presence of many groups of people who speak the same language or who come from the same ethnic grouping provided major inducements to transfer. This was true of migration into the Mindanao uplands, where many frontier sites were even named after places of origin in the Visayas.

Agricultural productivity, as it affects income and employment at the place of origin, greatly affected the likelihood of movement (Gonzales and Pernia, 1985). Higher rates of out-migration were observed, for example, in communities with less favorable agricultural conditions (Otsuka, 1987).

Hayami (1979) noted a significant decline in population when average farm sizes increased in Laguna province from 28.8 hectares to 45 hectares. The impact of existing land reform in overcoming pressures to limited land, and in expanding access to cultivable lands, has been minimal. In fact, there is at present a greater concentration of income and assets among large farms and increased landlessness in the rural sector. The ratio of cultivated land to population declined from 0.18 in 1960 to 0.11 in 1975, the years when upland population grew at a high rate of 3.03 percent per year (David and Otsuka, 1987).

1. *Econometric Models of Migration*

Three macro-migration econometric models were used to estimate the relative contributions of different factors to population movements in the uplands. These models are: (1) the *modified gravity model,* which evaluates migration across regional boundaries, (2) the *quasi push-pull model,* which explains inter-provincial movements, and (3) the *pull model,* which analyzes short-distance movements across municipal boundaries. The need to use three models follows from the observation that different factors emerge as significant depending on the nature of population movements.

a. *Migration Factors.* The principal factors affecting inter-area migration flows are classified into those associated closely either with areas of origin or of destination. For example, population at the place of origin is expected to influence migration through its effects on the marginal product of labor. Population in the area of destination, on the other hand, serves as a proxy for size of the labor market, the larger population centers having a greater number of job opportunities.

Correlates of processes related to origin and destination may be divided into personal characteristics of migrants and factors relating to the land. The usual variables associated with personal migrant characteristics are education and occupation. Education is measured by the literacy rate and is treated as an "amenity variable", the more literate population having the greater mobility. Literacy rate serves as a proxy measure of access to education services and does not reflect actual levels of educational attainment among migrants. Occupation is measured as the ratio of gainful workers (15-64 years) to the total employed in agriculture, fishing, and forestry.

The important land-based factors are availability of arable land and forest cover. Land availability is adjusted to reflect the average size of landholdings, site quality, and land tenure. Land size and quality are measurable from secondary data. Tenure is included as a binary variable for presence or absence of long-term property arrangements.

Forest cover serves as a proxy for land suitability, with areas of dense forest cover being more productive and stable. Forest cover is also correlated with density, i.e. high-density areas tend to have less forest cover owing to the conversion of forest lands to agricultural use.

Distance between areas of origin and destination has normally been associated with variable costs of transfer. Distance has a strong deterrent effect on movement, that is, longer distances tend to impose greater financial, physical and psychic costs. In the specific case of lowland-to-upland movements, stage migration is utilized to dampen the effect of distance on the decision to migrate. Since long-distance moves are generally by sea, the availability of ports of disembarkation and accessible transportation will have a close interaction with distance.

b. *Results of Macro-Migration Models.* The results of all three macro-migration models indicate that the availability of land in the uplands is the more important determinant of movement compared with factors associated with the area of origin. However, there are significant differences in the determinants depending on type of movement. As expected, in the long distance inter-regional flows, the actual length of distance travelled emerged as significant. This observation is consistent with national migration trends, where inter-regional flows were larger than intra-regional migration (Perez, 1978). For the relatively shorter, inter-provincial (intra-regional) flows, demographic factors such as population and education at the areas of destination served as the significant explanatory variables. At the municipality level (moves within province) land-related variables were more significant than demographic factors.

c. *Inter-regional Migration Function.* Inter-regional migration is specified in terms of the "gravity model", that is, gross migration is influenced by the number of actual movers and the distance of movement (Shyrock, Siegel, *et al.*, 1971). However, the model contains major limitations which may restrict its explanatory value. For example, the relative elasticities of origin and destination populations are assumed to be constant. In this way it fails to explain why population at destination is proportional to gross migration. Secondly, having a linear form, the gravity model can only inadequately capture migration decisionmaking and is inferior to the standard probabilistic migration models such as the logit or polytomous logit functions.

Table 6 presents the results of the measurements. Two factors, namely distance (DIST) and demographic size (POPi and POPj), account for the large variability in migration. The proportion of urban population is also significant and negatively correlated with migration, implying that the more densely populated areas with a higher percentage of urban population

Table 6
REGRESSION RESULTS OF INTER-REGIONAL MIGRATION MODEL

	Coefficient	*T-value*
Intercept	– 706.377	
POPi (Population at Place of Origin, 1975)	0.0024	2.562**
POPj (Population at Place of Destination, 1980)	0.0026	2.562**
DIST (Distance)	– 3.070	– 2.538**
Forest Cover	0.0273	0.734
Percent Urban Population, 1980	– 61.6976	1.355*
R – square	0.6419	
F-value	3.3645	
N (sample size)	30	

* significant at 10% level
** significant at 5% level
Source: Cruz, Zosa-Feranil and Goce (1986); taken from Table 4.5a, p. 121.

attract less migrants since land is less available. It will be noted, however, that forest cover is insignificant, although present urban population may be expected to have captured some of its effects. Distance is highly significant and negative, implying that it serves as a major deterrent to movement.

d. *Inter-provincial Migration Function.* A quasi push-pull model is used in explaining province-to-province movements within a region. The variables included in the model proceed from a dichotomy between conditions at the origin and at the destination. Unfavorable conditions at the place of origin encourage out-migration while prospects of a better life and good economic conditions at the place of destination tend to induce in-migration.

The results presented in Table 7 show that economic conditions at the place of destination have a greater effect on migration than the combined

Table 7
REGRESSION RESULTS OF INTER-PROVINCIAL MIGRATION MODEL

	Coefficient	*T-value*
Intercept	3517.72	
POPi (Population at Place of Origin, 1975)	0.0001	0.1129
POPj (Population at Place of Destination, 1980)	0.00123	1.3447*
PDi (Population Density at Place of Origin, 1980)	0.8208	0.3842
PDj (Population Density at Place of Destination, 1980)	– 2.9136	– 1.6680*
EDUCj (Education)	57.0743	2.5244**
LA (Land Availability at Place of Destination, 1980)	– 0.0812	– 0.0974
DIST (Distance)	– 0.6488	– 0.5152
EMPj (Employment Opportunities at Place of Destination, 1980)	6.0927	0.2770
R – square	0.4586	
F-value	1.3651	
N (sample size)	50	

* significant at 10% level
** significant at 5% level
Source: Cruz, Zosa-Feranil, and Goce (1986); taken from Table 4.3a, p. 115.

origin-related variables. However, this may be due to lack of information in the sending areas rather than the actual contributions of such variables to migration decisionmaking. Gonzales and Pernia (1983), for example, argue that the extent of migration at the place of origin serves as an indicator of agricultural productivity. High income levels and greater economic opportunities at the place of origin reduce the likelihood of out-migration as shown by inter-regional migration trends for 1960 to 1970. Otsuka's (1987) study of three villages with different production environments shows that areas with high adoption rates for modern rice varieties displayed a substantially larger population growth rate of 2.45 percent per year. Less favorable sites, such as those using rainfed agriculture, had large out-migration. Man-land ratios increased markedly in the irrigated areas (6.29 persons/hectare) relative to the rainfed sites (4.7 persons/hectare).

Three variables are significant in explaining movements within a region. These are population at destination (POPj), population density at destination (PDj), and education (EDUC). These variables indicate that area characteristics in the receiving provinces exert greater influence on migrant decisionmaking. However, these factors explain only 45 percent of the variation in inter-provincial migration.

The significant effect of the education variable on migration should be noted. Higher literacy rates at places of destination tend to attract more migrants while larger population densities have the opposite effect. However, migrants tend to be more literate as shown in their manner of evaluating economic options and in their ability to take risks in order to improve their livelihood.

e. *Inter-municipality Migration Function.* In general, short-distance population movements (within province) are sensitive to three factors — population at the place of destination (POPj), land availability (LA), and site quality (DSLP) as measured by average slope. In contrast to the effect of distance on movement shown in the previous models, absolute population levels at the place of destination, rather than distance, served to induce migration through its effect on information flow. A larger population increases the chances of establishing contacts and finding ethnic similarity (such as friends and relatives, or those who speak the same dialect).

Table 8 presents the results of the model showing the importance of all land-related factors except LUIA, which is the percentage of arable land to total agricultural land. The inadequate measurement of "arable" land (being based solely on slope) possibly contributed to its poor performance in the model. Since the movements are relatively shorter compared to the previous models, the distance variable was not significant either.

The appearance of the land area variable (LA) as highly significant is as expected. However, its relative contribution to inter-municipality migration is quite low (0.89). In contrast, the slope variable (DSLP), which serves as the environment's impact on population movement, has an inverse effect on migration. The effect is substantial, a one percent increase in steepness (slope) causing a three percent decline in migration. Both land-based variables explain more than one-half of the variation in migration.

Another significant land-related factor is the presence of non-farming

Table 8
REGRESSION RESULTS OF INTER-MUNICIPALITY MIGRATION MODEL

	Coefficient	*T-value*
Intercept	722.486	
POPi (Population at Place of Destination, 1980)	0.0040	10.284**
LA (LandAvailability)	0.8949	2.745**
LUIA (Percent Arable Land to Total Agricultural Land Area)	1.669	0.544
DSLP (Dummy Variable for Slope)	– 320.921	3.109**
DIST (Distance)	– 23.1108	0.129
NFOP (Availability of Jobs)	– 220.880	– 1.111*
R – square	0.7467	
F-value	32.1369	
N (sample size)	160	

* *significant* at 10% level
** significant at 5% level
Source: Cruz, Zosa-Feranil and Goce (1986); taken from Table 4.1, p. 106.

opportunities (NFOP), which is treated as a binary variable for logging or non-logging sites. It is hypothesized that the availability of jobs in logging concessions would lead to greater in-migration. However, the coefficient turned out to be negative, indicating that migrant preferences were oriented more towards agricultural opportunities as shown by the land availability variable rather than off-farm work. Overall, the "pull" model used in explaining inter-municipality migration was significant, explaining almost 75 percent of the variation in migrant behavior.

IV. Case Study of Upland Migration

Most studies of internal migration in the Philippines are based on demographic data obtained from various censuses and analyzed at the provincial and regional levels. While Part III evaluated migration trends using macro data, this section focuses on the analysis of upland migration within the specific context of a particular community and environment. Three topics are included: (1) migrant adjustment processes after movement, (2) "factors influencing" migrant livelihood opportunities upon arrival, and (3) variations in resource use and access to forest resources.

1. *Geographic Description and Location*

The communities in the case study are Putho-Tuntungin, Lalakay, and Puting Lupa, all located within the Mount Makiling watershed surrounding the municipalities of Los Baños, Calamba, and Bay in Laguna province, and Sto. Tomas municipality in the nearby province of Batangas. Map 1 shows the general location of the study sites, and Table 9 provides a breakdown of the population and sample included in the socio-economic survey.

The Makiling forest covers about 4,244 hectares, with elevations varying from 200 to 2,000 meters above sea level (Lantican, 1974). The

Table 9
DISTRIBUTION OF THE POPULATION AND SAMPLE FOR THE UPLAND MIGRATION SURVEY

	Putho-Tuntungin	Lalakay	Puting-Lupa	Total
Total Household Population[1]	588	377	120	1,085
Total No. of Migrant Households[2]	356	260	87	703
Percent Migrant Households to Total Household Population	60.5	69.0	72.5	64.8
Total Sample Size (n)	18	13	9	40
Percent of Sample to Total Migrant Household Population	5.1	5.0	10.3	5.7

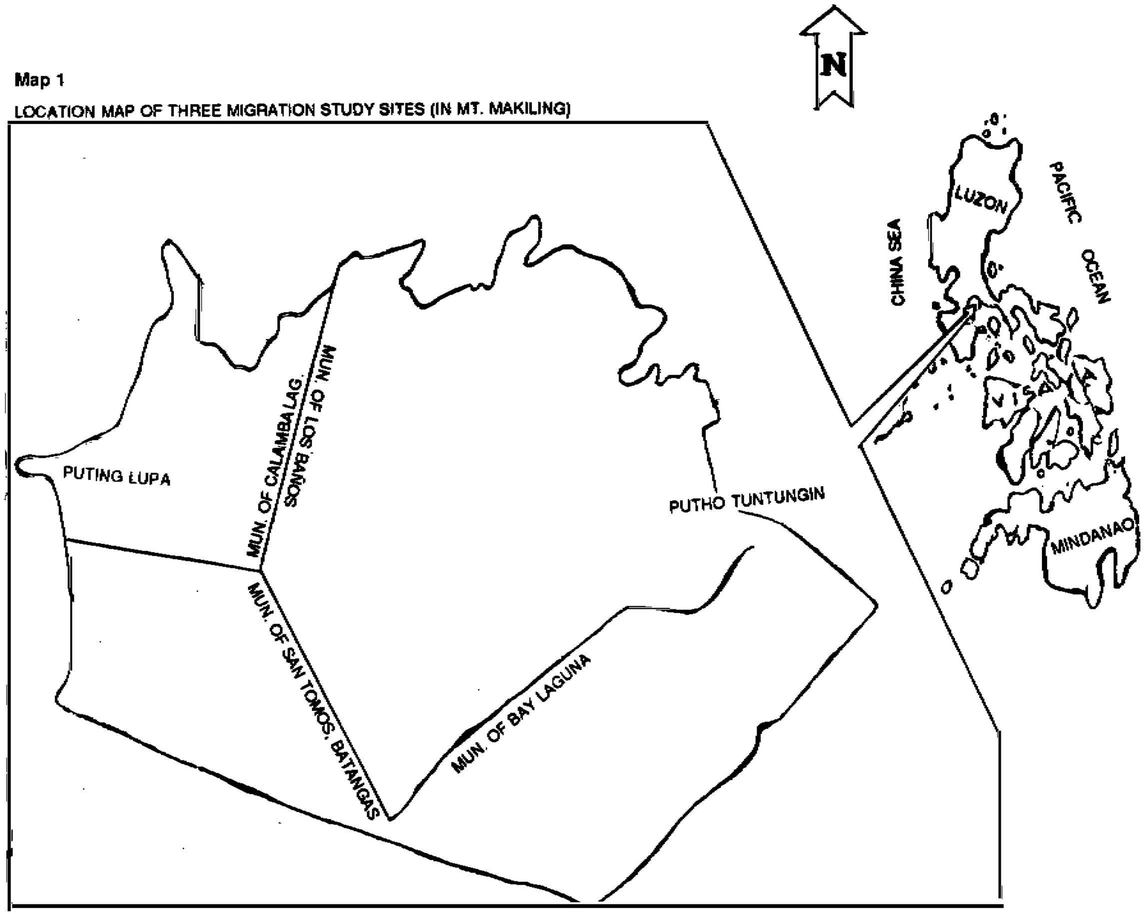
[1] Data generated from the barangay captain's enumeration of the sitio's population in 1985.

[2] Based on barangay captain's assessment of migrant households in the sitio as of 1985. "Migrant" defined as moving residence from a different municipality or province.

Source: Cruz, Zosa-Feranil and Goce (1986); Table 5.1, p. 133.

Map 1

LOCATION MAP OF THREE MIGRATION STUDY SITES (IN MT. MAKILING)



forest serves as an upper catchment for over 2,000 hectares of irrigated ricelands in the surrounding municipalities of Calauan, San Juan, Calamba and Los Baños in Laguna province and the sole catchment for Laguna Lake.

Most of the Makiling highlands are rugged and steep. Along the western slope is a series of hilly to flat lands with numerous collecting basins and marshlands. On the eastern slopes, the Cambantoc River has an extensive tributary that allows some form of upland agriculture.

In general, soils in the Makiling forest are suitable for upland agriculture, being well-drained. The dominant soil type is volcanic and the soil series is Macalod clay loam (UPLB-CF, 1979). The dark brown topsoil reaches a depth of 35 to 40 centimeters. The subsoil is gravelly clay loam with a substratum consisting of hard rocks.

The heaviest rainfall occurs in the months of August through November, with an average monthly precipitation of 250 mm. The dry months are January until May. For the period 1966 to 1985, the average yearly rainfall was 1,845.9 mm, which was significantly higher than the 965 mm average for the entire country.

2. *Settlement History*

Historical accounts of activities in Mount Makiling indicate that settlement in the nearby towns of Bay and Los Baños started as early as 1593. Franciscan missionaries built a church and sanitarium called Agua Santas, referring to the natural hot spring water of volcanic origin. Based on available census data and accounts of key informants, there were three significant stages of migration that evolved after the 17th century.

The first stage was in the early years of settlement up to 1918. Most of the early migrants settled on the Western side, with an average population growth rate of 4.3 percent per year.

The second stage of in-migration occurred with the opening up of interior forest lands starting in 1960, with movements sustained up to 1970. The rate of population growth during this period escalated to 8.4 percent per year, the largest increases occurring in the years 1960 to 1963. By 1960, in fact, the population had already increased three-fold from the 1948 population level, but it was in 1965 when frontier migration peaked.

In the third stage of population movement (after 1970), there was a slight decline in in-migration. A larger proportion of migrants was made up of landless workers from the nearby municipalities of Quezon province, although a significant number also came from the Bicol region. Migration into the interior forest continued, and as lands became scarce, two new practices emerged.

The first practice involved the maintenance of two farming households. One household would maintain the productive farm plot, which would normally be located near the village settlement at the foothills. The other plot would be less productive and located in the steeper portions of the forest. This plot would be cultivated by relatives or friends who had newly arrived, usually for a period of about six months to a year, until a separate plot could be found.

The second practice involved the recruitment of landless workers, mostly from the Bicol region. These landless laborers would be given around 300 square meters of homelot in exchange for one year of labor in the cultivation of upland crops. By 1980 many of the recruited laborers had set up swiddens in the remote steeper sections of the forest.

3. *Profile of Migrants in Makiling*

A large proportion of migrants in the Makiling case study sites were born in the Southern Tagalog region. In fact, 42 percent of migrants came from nearby Batangas province. The long-distance migrants came from Northern Luzon but a good 15 percent of migrants originated from the Bicol and the Visayas.

a. *Age-Sex Characteristics.* The average age of migrants is 48 years, the household size being six. The average age of migrants was 26 years at the time they arrived at Mount Makiling, which is consistent with other studies of frontier migration where the average age of migrants ranged from 23 to 28 years (Wernstedt and Simkins, 1965).

There is a slightly male predominance among the population at Mount Makiling, with a sex ratio of 103 males for every 100 females. During the years of rapid in-migration, the population was predominantly male, with a male-female ratio of 116.

b. *Marriage and Kinship Ties.* About one-half of migrants who moved into the Makiling area in 1960 to 1970 were married, the rest being single males. As population movements progressed, there was a significant decline in the proportion of unmarried migrants (28 percent in 1980).

Kinship ties are reflected in the number of relatives residing in the area at the time of movement. The mean number of relatives at the time of arrival was three in 1950, increasing to five in 1980.

Among single migrants who moved to Mount Makiling and later married, about 83 percent chose partners coming from the same places of origin. This preference for marrying within their own ethnic grouping reinforced the closeness of various migrant families.

c. *Tenure.* To differentiate between various types of land access, land tenure data were gathered. However, since many households had access to several parcels of land under varying property arrangements, the dominant tenure status was defined as that pertaining to the piece of land which provided the highest income and on which the household spent a majority of its labor time.

In general, there are four dominant property arrangements as perceived by respondents. These arrangements are: owner, tenant, lessee, and freeholder. Owners are those with legal claims to the land, such as a Certificate of Land Title or receipts from payment of taxes. Tenants are resident cultivators of lands "owned or claimed" by absentee landlords. The tenancy arrangement varies, ranging from a 50-50 to a 70-30 sharing with landlords receiving 30 percent of harvest but not contributing to the cost of production. Lease arrangements, on the other hand, are based on a fixed payment (whether in cash or kind) to an "owner or claimant". There were only three cases where a written lease contract was made, the rest being oral agreements.

The freehold concept is the dominant form of tenure at Mount Makiling, accounting for over one-half of the sample farms. Under the freehold, property arrangements are categorized in three ways. The first classification uses number of years of occupying the land as the sole criterion for legitimizing a claim. Migrants who have stayed in the land prior to 1960 are considered "owners," while those who came after 1960 are labelled as "claimants or occupants." Migrants who arrived after 1980 are called "squatters."

The second type of "free user" follows the government's stewardship concept. The user holds a legitimate right to the land through a 25-year contract with the municipal government. The user pays an annual land tax, but in essence such a tax is "illegal."

The third category of free use treats the land as a "common" resource among two or more families belonging to a single lineage or clan. Each family is entitled to the produce from the land if one contributes labor and shares in the cost of inputs.

A majority of free users tend to occupy large landholdings, while tenants and lessees have comparatively smaller average landsizes. In terms of income earned, however, the opposite trend can be observed where owners tended to have higher incomes than free users. Tenants and lessees have the smallest incomes, with 80 percent and 50 percent, respectively having incomes less than ₱5,000 per year (see Table 10).

4. *Upland Agriculture*

Agriculture in the uplands of Mount Makiling is characterized by a diverse cropping pattern. There are 42 observed crop mixes with an average of four types of crops planted per parcel of land. Perennials are

Table 10
DISTRIBUTION OF INCOME AND LANDSIZE BY TENURE STATUS (N=40)

	Tenure Status				
	Owner	*Tenant*	*Rent/ Lease*	*Free Use*	*Total*
Landsize (hectares)			Percentage Distribution		
Less than 1 ha.		40.0	58.3	25.0	35.0
1.0 – 1.9		20.0	25.0	20.0	20.0
2.0 – 2.9	33.3	20.0	16.7		10.0
3.0 – 3.9	33.3			5.0	5.0
4.0 – 4.9	33.3	20.0		20.0	15.0
5.0 and above				30.00	15.0
Total	99.9	100.0	100.0	100.0	100.0
Average Annual Income (₱)			Percentage Distribution		
Less than ₱5,000	33.3	80.0	41.7	50.0	50.0
₱ 5,000 – 7,999			33.3	30.0	25.0
₱ 8,000 –10,999		20.0	8.3	5.0	7.5
₱11,000 – 20,999			8.3	10.0	7.5
₱21,000 – 30,000	66.6		8.3		7.5
More than ₱30,000				5.0	2.5
Total	99.9	100.0	99.9	100.0	100.0
Number of Observations	3 (7.5%)	5 (12.5%)	12 (30.0%)	20 (50.0%)	40 (100%)

Source: Cruz, Zosa-Feranil and Goce (1986); Table 5.10, p. 166.

found mostly in the upper slopes but many fruit trees such as jackfruit are already on the nearby hilly sideslopes.

Fields are burned and cleared from March until May, when the fields are relatively dry. Cutting of grass and other standing vegetation takes three weeks, but in general, fields are never completely cleared of vegetation.

The small proportion of households cultivating upland rice indicates that many families are avoiding the laborious work of land levelling. There is also a prolonged rainy season but fields are not adequately drained making water control even in semi-terraced fields difficult.

The peak-labor periods coincide with the dry months which are normally suitable for clearing and burning. The other labor peak occurs in November where a second rice crop is planted together with corn. Hired labor appears to be the dominant form of labor contract for rice.

Farming activities take up 86 percent of the total labor allocated and 74 percent of family labor. Of the 25 hours per week spent in the cultivation of crops, about two-thirds (or 17 hours) are spent on own fields. The other third (8 hours) is given over to work in other farms or to off-farm work (4 hours).

5. *Exploratory Model of Production and Income*

In this section, an exploratory production-income model is discussed to explain differences in income among migrant households. The model is designed to evaluate income or production-related consequences of migration, rather than seeking the determinants of migration, which was done in Section 3.0. However, as Da Vanzo (1981) points out, because the consequences of migration are often anticipated and in fact are key determinants of the final decision to move, some of the conceptual and methodological issues considered in this discussion can be viewed as common to both types of migration models.

A multiple regression model, using ordinary least squares, is used with total household income (measured as the inputted value of total production) as dependent variable and three sets of independent variables. The latter are: (1) site-quality factors, (2) variables related to access to resources, and (3) household-labor characteristics. Land distribution or equity measurements are treated separately in the next section using a Gini ratio of land concentration.

The earlier work of Cruz *et al.* (1987) on upland corn production in two other survey sites in the Philippines indicates that land size was insignificant relative to site-quality factors and that crop diversification for soil conservation tended to reduce output. In this study, it was assessed that labor availability was more constraining than land.

To approximate site quality, scores are assigned depending on a combined slope and soil fertility criterion. The land size variable (V2) appears as a site-quality controlling factor. It is hypothesized that families with marginal, less fertile lands tend to acquire more lands to compensate for the loss in fertility.

The second set of factors have to do with differences in a household's access to resources. Access is measured in terms of amount of credit received (V3) and presence of relatives as potential sources of credit and other services (V4). The latter variable (V4) serves the additional function of testing for a household's security, households with more relatives being more stable.

Household characteristics refer to the nature of the household as production unit. The dependency ratio (V5) provides information on the household's consumption demand relative to its work force. A binary variable for non-farm income (V6) is also included to reflect presence of supplementary income sources. Percent of output sold in the market (V7) is expected to be positively correlated with income, but intervening factors like market prices and transport, and hauling costs are not directly computed.

Households with more than one parcel to cultivate normally plant perennials in the other parcel. V8 is a binary variable, receiving a value of one if perennials are planted. One expects it to be positively correlated with income. Education (V9) is also directly related to income. Finally, V10, a binary variable for presence of conservation practices, tests whether the application of conservation techniques affects income negatively. For example, Segura-delos Angeles (1985) points out that the higher income farms were less likely to adopt soil conservation practices.

6. *Measurement Results of Production-Income Model*

Table 11 contains a summary of the results of the regression estimates. In general, the results indicate that the demographic dependency burden is significant, reinforcing the belief that labor, rather than land, is the constraining factor in the uplands. The land variable appeared significant but it contributes less than 30 percent of the variation in income.

Site quality is significant, but the values of the coefficients were much lower than anticipated, compared to the large 30 to 40 percent effect on corn yield earlier cited by Cruz *et al.* (1987) for two other sites with similar environments. With respect to credit (V3), one must explain its negative coefficient. The presence of large loan amounts may have served to reduce overall income itself as interest payments may have increased total production expenses. In addition, the low coefficient value for credit shows that the role of formal credit in augmenting income may not be very significant, so that the wide range of kinship ties may more than offset the non-availability of credit.

Participation in the local market is measured by percent of total production sold (V7). The highly significant value and positive sign of the coefficient indicate the important role of commercialization of output in improving the value of total production. It also shows the significance of farmers' access to markets in augmenting farm incomes.

Most of the binary variables turned out to be significant. Presence of relatives (V4) is positive and significant as expected. Presence of perennials (V8) and conservation practices (V10) are both significant, showing the

Table 11
REGRESSION RESULTS OF PRODUCTION-INCOME MODEL

		Coefficient	*T-value*
Intercept		793.14	
V1	Site Quality	0.0924	1.937**
V2	Landsize	0.2713	1.9768**
V3	Amount of Credit Received	– 0.0111	1.9765**
V5	Economic Dependency	0.0098	2.8607**
V7	Percent Output Sold in Market	0.1352	2.1765*
V8	Percent of Parcel Planted to Perennials	0.2744	1.9449**
V9	Education	0.0937	1.1765
V10	Dummy Variable for Presence of Conservation Practices	– 0.1398	– 2.0807**
R – square		0.669	
F-value		7.63	
N (sample size)		80	

* significant at 10% level
** significant at 5% level
Source: Cruz, Zosa-Feranil, and Goce (1986); taken from Table 5.16, p. 190.

importance of land-related factors. The negative sign of V10 supports the view that conservation techniques are in fact costly for a household to shoulder so that subsidies may be needed to compensate for the loss in income. Lastly, education (V9) appeared significant but with a low coefficient, indicating a primarily neutral effect of education on migrant incomes.

To summarize, the important determinants of migrant incomes are: (1) acquisition of lands of good quality, (2) access to credit for purchase of inputs, (3) increased commercialization of farming activities, (4) promotion of diversified cropping patterns, and (5) planting of perennials. The presence of relatives also had a positive impact on income. The negative sign for use of conservation practices (V10) supports the argument for increased public subsidy for soil conservation.

7. *Equity Considerations*

An examination of land distribution in Mount Makiling is made by comparing Gini ratios for two sets of landholdings: (1) lands in the entire upland village having different types of tenurial arrangements and (2) lands found only within the forest zone which are predominantly under a freehold system. The results of the estimates of land distribution and their corresponding Gini ratios are shown in Table 12.

In general, the Gini ratio measures the degree of relative inequality in the allocation of landholdings. The desired ratio is a value close to zero. Land distribution for the entire area is relatively unequal, with a Gini ratio of 0.697. Around 12 percent of households own over 66 percent of the land while 55 percent of the population have access to only 8 percent of the land area.

In contrast, land distribution in the forest zone tends to be more equitable under a freehold system. Under such a system, some form of common property arrangement exists allowing "free use" of land resources but not complete, open access. Informal rules and sanctions for controlling membership in the community and access to unoccupied lands exist to

Table 12
GINI RATIO OF CONCENTRATION BASED ON NUMBER OF HOUSEHOLDS AND SIZE OF LANDHOLDINGS (N=40)

Farm Size (ha.)	Number of Households	Distribution of Households	Cumulative Percentage Distribution of Households	Total Land Area	Percent Distribution of Land Area	Cumulative Percent Distribution of Land Area
Less than 1.0	14.0	35.0	35.0	23.8	2.20	2.20
1.0 – 1.9	8.0	20.0	55.0	58.7	5.44	7.64
2.0 – 2.9	7.0	17.5	72.5	67.0	6.21	13.85
3.0 – 4.9	60.0	15.0	87.5	209.5	19.42	33.27
More than 5.0	50.0	12.5	100.0	720.0	66.73	100.00
Total	400.			1,079.01		

Gini Ratio:

Entire Area = 0.697
Forest Area = 0.244

Ratio of Highest to Lowest Fifth = 30.33

Note: Format of Table adopted from Ledesma (1982)

Source: Cruz, Zosa-Feranil and Goce (1986); Table 5.17, p. 192.

guard against squatting, although technically the forest occupants in these lands do not have legal claims to the lands they currently occupy. The distribution of claims to these freehold lands is more equitable: 50 percent of the population occupy 37 percent of lands. The Gini ratio is significantly lower at 0.244, a ratio comparable to a lowland rice growing community where full-scale land reform has been implemented (Ledesma, 1982).

However, these findings do not necessarily lead to the conclusion that all tenure in the uplands should be converted to freehold. The Gini ratios indicate rather that land distribution tends to be more equitable when communal rules of land acquisition predominate over private property where some form of land market operates in the distribution of landholdings. But many questions still remain regarding the process of land distribution once new settlements are formed after migration. These include questions regarding: (1) who controls the distribution of lands, (2) who determines land allocation for new migrants, and (3) how old settlers control squatting in previously-claimed lands. Answers to these and other questions will be important in formulating a land redistribution scheme for the uplands.

V. Summary

There is a need to address the larger issue of population growth and the increasing attractiveness of forestlands as places of destination. National population growth trends indicate critical levels of overpopulation in less than 20 years. The country is projected to reach around 76.9 million persons by the end of the century, and at least 125 million by the time zero population growth is attained in the year 2075 (Vu and Elwan, 1982). The birth rate of 2.59 percent per year is substantial, given that the upland population is large so that even a small rate of increase can produce considerable yearly increments.

In broad terms, forest farmers in the Philippines could be clearing, at the very least 500,000 hectares of forest each year, whether on a permanent or temporary basis. Many of these migrant farmers convert lands from secondary forest. In some regions of the country, such as Cagayan, Southern Tagalog, and Southern and Central Mindanao, population densities are low enough to allow the forest to be used while sustaining its quality, with the prospect of eventual regeneration. However, there is no sign that the rate of increase in upland population will significantly decline to less than two percent per year.

Government programs must also address poverty in the uplands, the upland dweller being one of the "poorest of the poor" in Philippine society. The upland migrant must be viewed as a "victim," rather than the "perpetrator," of forest destruction. Indeed their characterization as "shifting cultivators" is much less appropriate than that of the *"shifted cultivators"* — the upland migrants are often pushed into marginal environments as access to cultivable lands and unemployment worsen (Myers, 1984).

The complementation of institutional with technical change is probably nowhere as apparent as it is in the case of ensuring sustainable cultivation in the uplands. The case study in Mount Makiling, Laguna, indicates that secure tenure and appropriate technical support are important minimum elements for any realistic program for the uplands.

The more equitable income distribution among lands with secure claims in Mount Makiling, as well as the highly significant effect of tenure on family income, indicates that there is a case for legitimizing claims of existing residents. The widespread practice of multi-cropping and agroforestry among the sample respondents also point to the important contributions by the scientific community and the effectiveness of extension activities.

The production strategy in Mount Makiling encourages diversified, multi-storied cropping. The results of the exploratory production-income regression model show the positive effect on migrant incomes for both food and fuelwood uses of trees through the efficient combination of annual and perennial plants and herbaceous and woody species.

In two documented farm households, a multiple layering of crops was observed. At the ground level, a short-stemmed cereal (upland glutinous rice) was planted alongside vegetables like carrots, squash, and some root crops. A second layer from 2 to 5 meters in height were the taller-standing corn, cassava, and fruit trees (banana and papaya). Then a third layer of rambutan and coconut trees exploit the sun's energy allowing the roots of trees to serve to bring up nutrients useful to other crops. Such examples of "forest gardens" among upland migrants in Mount Makiling suggest the viability of expanding appropriate extension programs, at the same time that land security is achieved through changes in property rights.

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