DISPERSAL OF POPULATION AND ITS EFFECTS ON RESOURCE MOBILIZATION: A CASE STUDY OF LANDLOCKED NEPAL*

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Introduction

The population in Nepal (11.56 million according to the 1971 census) has an unbalanced distribution in its two main regions, the Hills (7.15 million) and the Terai (4.41 million). The reasons are twofold. The Terai was a malaria-affected region and the transportation facilities were poor. With the malaria eradication programme being successfully carried on, the Terai became an increasingly habitable region. Improved transportation facilities over time also rendered population dispersal programmes easier to implement.

The government's regional development and population dispersal programmes have indirect effects on other variables in the economic system, and these effects may be favourable or unfavourable. One of the unfavourable effects is on the export performance of Nepal and hence indirectly on the domestic development itself, since developmental expenditures are linked to foreign exchange availability.[1] The Terai is a food surplus region both because of its agriculturally favourable factors and relatively sparse population. Due to the poor transportation facilities to the Hills, the marketable surplus does not move to the agriculturally poor, food-deficit hilly regions but moves out across the frontier to India. Thus the principal exports of Nepal, food, are the result of an artificially suppressed domestic demand. If the transport facilities between the two regions were better, food exports from Nepal would have been lower. Secondly, if population were more evenly distributed, total domestic consumption would have been much higher, thereby reducing the exportable surplus.

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[1] For greater details, see the authors' paper on "Some of the Trade Problems of Landlocked Nepal" presented at the Workshop/Conference on "Family Planning, Population and Development in Nepal," held at the University of California at Berkeley during August 25-29, 1975.

Thus, the apparent policy implications are clear. If the same rate or a high rate of development expenditure has to be continued or has to be achieved, maintenance of the same level of food exports or an increase in exports is needed. In order to keep up the same level, or to increase it, domestic production has to be increased so as to more than offset the increase in domestic consumption of food consequent to improved transportation facilities between the regions and population dispersal programme from the Hills to the Terai. Overall Grow-More-Food programmes would have to include increased outlays for agricultural development in both regions. The objective of this paper is to examine whether the apparent policy implications, as outlined above, are correct in light of actual progress of the economic system and, if not, to present an alternative guideline of actions for policy makers.

The Model

The model designed to test the policy conclusions is more influenced by the data constraints than by any other considerations.[2] It is postulated that food exports of Nepal are influenced by population and food production in the two regions. In turn, population in the two regions is influenced by transportation facilities between the regions, expenditure on health and availability of food. Further, supply of food production depends upon total development expenditure and labour. Finally, total development expenditure is conditioned by the availability of foreign exchange earnings through food exports and foreign aid. Thus, the model is one of a simultaneous equation system with four endogenous variables and eight pre-determined variables which include four lagged endogenous variables. The endogenous variables are: food exports in constant prices, ratio of population in the Hills to the Terai, ratio of food production in the Hills to the Terai and total development expenditure. The four exogenous variables included in the eight pre-determined variables are: external aid at constant prices, ratio of health expenditure to total development expenditure, ratio of agrciultural expenditure to total development expenditure and ratio of transport development expenditure to total development expenditure.

$$X_F = f\left(\frac{P_H}{P_T}, \frac{F_H}{F_T}, X_{F_{-1}}\right) \tag{1}$$

$$D = f\left(X_F, F_A, D_{-1}\right) \tag{2}$$

[2] Serious difficulties have been experienced in finding out the proportion of development expenditure in the Hills and the Terai to the total development expenditure. The authors were forced to use total expenditure in the place of ratio of regional development expenditure.

$$\frac{P_H}{P_T} = f\left(\frac{T_{Ex}}{D}, \frac{H_{Ex}}{D}, \frac{F_H}{F_T}, \frac{P_H}{P_{T_{-1}}}\right) \quad (3)$$

$$\frac{F_H}{F_T} = f\left(\frac{P_H}{P_T}, \frac{A_{Ex}}{D}, \frac{F_H}{F_{T_{-1}}}\right) \quad (4)$$

Where X_F = Food Exports in Constant Prices

P_H = Population in the Hills

P_T = Population in the Terai Region

F_H = Food Production in the Hills

F_T = Food Production in the Terai

T_{Ex} = Transport Expenditure in Constant Prices

H_{Ex} = Health Expenditure in Constant Prices

F_A = Foreign Aid in Constant Prices

D = Total Developmental Expenditure in Constant Prices

A_{Ex} = Agricultural Expenditure in Constant Prices

The basic data are presented in Table 1. The sources of data are given in Appendix 1.

Since there is simultaneity involved in this system of equations, the estimation has to be performed through two-stage least squares method, and a stochastic error term was added to each of the equations. For regression analysis, log linear forms of the equations have been adopted.

$$\log F_X = a_1 + a_2 \log \frac{P_H}{(P_T)} + a_3 \log \frac{F_H}{(F_T)} + a_4 \log F_{X_{-1}} + e_1 \quad (1)$$

$$\log D = b_1 + b_2 \log F_X + b_3 \log F_A + b_4 \log D_{-1} + e_2 \quad (2)$$

Table 1 : **BASIC DATA**

Year	*Price Index*	*Food Exports (million) rupees)*	*Hill Population (millions)*	*Terai Population*	*Development Expenditure*	*External Aid*	*Transport Expenditure*	*Health Expenditure*	*Food Production*		*Agriculture Expenditure*
									in the Hills (1000 M/T)	*in Terai* (1000 M/T)	
1	2	3	4	5	6	7	8	9	10	11	12
1960—61	94	2.23	6.34	3.07	83.4	137.1	28.91	10.3	418.55	1679.45	10.3
1961—62	94	2.82	6.46	3.13	86.2	128.8	29.88	10.5	418.95	1681.05	10.4
1962—63	100	2.77	6.57	3.18	94.9	83.7	32.84	10.80	419.35	1688.65	10.5
1963—64	109	2.67	6.69	3.24	152.0	165.9	52.66	11.57	420.55	1687.45	10.82
1964—65	125	3.52	6.81	3.30	231.9	182.8	125.0	14.81	439.10	1761.90	10.61
1965—66	136	2.76	6.93	3.35	280.8	175.3	145.9	18.50	440.3	1766.7	10.38
1966—67	111	3.84	7.05	3.41	268.2	172.2	135.8	15.5	379.2	1628.1	22.05
1967—68	133	2.95	6.65	4.01	281.2	158.1	161.2	15.5	412.0	1707.4	26.82
1968—69	138	4.15	6.77	4.08	344.2	185.9	234.5	17.0	426.4	1751.8	30.50
1969—70	138	3.55	6.89	4.15	464.7	243.7	301.7	24.0	437.1	1804.2	35.31

Source : See Appendix 1

$$\log \frac{P_H}{P_T} = c_1 + c_2 \log \left(\frac{F_H}{F_T}\right) + c_3 \log \left(\frac{H_{Ex}}{D}\right) \quad (3)$$

$$+ c_4 \log \left(\frac{T_{Ex}}{D}\right) + c_5 \log \frac{P_H}{P_{T_{-1}}} + e_3$$

$$\log \frac{F_H}{F_T} = d_1 + d_2 \log \left(\frac{P_H}{P_T}\right) = d_3 \log \left(\frac{A_{Ex}}{D}\right) \quad (4)$$

$$+ d_4 \log \frac{F_H}{F_{T_{-1}}} + e_4$$

Results of Regression Analysis :

The results are presented in Table 2. The total developmental expenditure is positively associated with food exports and external aid. The tests of significance are not conclusive in a two-stage least squares regression analysis. However, it may be said that external aid influences developmental expenditure to a larger extent than the earnings from food exports.

A relatively poor fit has been obtained in the case of food exports function as indicated by the low R^2. However, the coefficients of the two variables, ratios of population and ratios of food production in the two regions have the expected signs. Given the population in the Hills, a lower level of population in the Terai would increase food exports. Similarly, given the food production in the Hills, a higher level of food production in the Terai would increase food exports. However, as both R^2 and the t tests are low, it would not be appropriate to rely on the estimates.

As regards the regression equation for ratio of population in two regions as a dependent variable, the coefficients of the variables have the expected signs. Given other things, a higher proportion of transport expenditure would decrease the ratio of population in the Hills to that of the Terai. This confirms the view that population from the Hills would move to Terai, other things remaining the same. Similarly, an increase in the ratio of health expenditure to total developmental expenditure would increase the population in the Terai, given other things. This also confirms our earlier observation that the Terai becomes more habitable due to malaria eradication and other health programmes. Further, the ratio of population in the two regions has a positive association with food availability in the two regions. However, as t values being low, the estimates cannot be relied upon even

Table 2 : RESULTS OF REGRESSION ANALYSIS[a]

(Figures in parentheses denote 't' values)

Dependent Variable	Intercept	Log F_X	Log $\frac{P_H}{P_T}$	Log $\frac{F^M}{F_T}$	Log F_A	Log $\frac{H_{Ex}}{D}$	Log $\frac{A_{Ex}}{D}$	Log $\frac{T_{Ex}}{D}$	Log F_{X-1}	Log D_{-1}	Log $\left(\frac{P_H}{P_T}\right)_{-1}$	Log $\left(\frac{F_H}{F_T}\right)_{-1}$	R^2	D.W[b]
Log F_X	—8.534	—	0.457	—3.187	—	—	—	—	—0.036	—	—	—	0.364	2.833
	(—2.807)		(1.089)	(-1.519)					(—1.001)					
Log D	0.849	0.233	—	—	0.441	—	—	—	—	0.985	—	—	0.906	0.840
	(0.755)	(0.752)			(1.830)					(8.910)				
Log $\frac{P_H}{P_T}$	0.727	—	—	0.251	—	—0.006	—	0.291	—	—	0.081	—	0.587	1.475
	(0.434)			(0.200)		(—0.034)		(-1.370)			(0.774)			
Log $\frac{F_H}{F_T}$	—1.510	—	—0.188	—	—	—	—0.062	—0.122	—	—	—	0.013	0.577	2.269
	(—32.409)		(—1.873)				(—2.627)	(—2.890)				(1.089)		

Notes: (a) For explanation of symbols, please see the text.
(b) Durbin-Watson statistic.

when one considers that t tests themselves are unreliable in a two-stage least squares analysis.

Finally, the ratio of food production in the Hills to the Terai is significantly influenced by the ratios of agriculture and transportation expenditure to total developmental expenditure. A higher proportion of agricultural expenditure or transportation expenditure would increase food production in the Terai to a greater extent than food production in the Hills. Both these expenditures thus react favourably on the supply side of food production in the Terai. Though these coefficients fulfill the t tests of significance, the t tests themselves are not conclusive evidence.

The ratio of food production in the two regions has a negative association with population ratio in the two regions, indicating an increase in the population of Terai, given other things has a negative effect on food production in the Terai.

Summary and Conclusions

An econometric analysis based on a simultaneous equation system of Nepal's regional development with special emphasis on population dispersal from the Hills to the Terai region indicates that : (a) The Terai region contributes to Nepal's export earnings by producing exportable food surplus; (b) lowering the ratio of population in the Hills to that of the Terai would reduce the food exports; (c) increase in the proportion of expenditure on transportation and health to total developmental expenditures to contribute to the dispersal of population from the Hills to the Terai region; and (d) an increase in the proportion of expenditure on agriculture to total development expenditure contributes to more than proportional increase in the food production in the Terai region.

Based on the above findings, the conclusions would be: (1) While total developmental expenditure is influenced to a larger extent by foreign aid, earnings from food exports of Nepal are still important. As foreign aid is subject to factors outside the control of the government, it would be feasible to step up earnings through food exports by domestic measures; and (2) While regional development programmes with special emphasis on population dispersal from the Hills to the Terai are carried out, it would be beneficial to increase the proportion of development expenditure on agriculture to total developmental expenditure.

We feel that the above conclusions could have earned greater authenticity if we had data on the proportion of developmental expenditure for the two regions in the spheres of agriculture, transportation and health. The data limitations have forced us to undertake a

very cursory analysis, but we feel that the above results, however limited, may be of interest to policy makers in Nepal.

APPENDIX 1

1. His Majesty's Government of Nepal, Central Bureau of Statistics, *Population Census 1971* (Kathmandu: Government Press, 1973).
2. His Majesty's Government of Nepal, Ministry of Finance, *Annual Budget Speech,* Various issues (Kathmandu : Government Press).
3. His Majesty's Government, Ministry of Food and Agriculture, *Agricultural Statistics of Nepal,* (Kathmandu : Economic Analysis and Planning Division, 1972).
4. Nepal Rashtra Bank, *Annual Report,* (Kathmandu: Nepal Rashtra Bank), various issues.
5. Nepal Rashtra Bank, *Quarterly Economic Bulletin,* Vol. III, No. 3, April 1974.