

July, 1974

POPULATION, RESOURCES AND JOBS
A SUMMARY STATEMENT

By

John W. Mellor

Occasional Paper No. 77
Employment and Income Distribution Project
Department of Agricultural Economics
Cornell University

Research supported by Contract No. AID/csd-2805
"The Impact of New Technology on Rural Employment and Income Distribution"
Cornell University and the United States Agency for International Development

July, 1974

POPULATION, RESOURCES AND JOBS

A SUMMARY STATEMENT*

By

John W. Mellor

CONTENTS

Introduction	1
Population Growth and Resource Productivity	2
Population Growth and Capital Supplies	4
Income Growth, Distribution and Fertility	5
Policies for Control of Population and Growth of Employment . .	6

TABLES

1. Average Propensity to Expend, (APE) on Various Expenditure Categories, by Expenditure Classes, India, 1964-65	7
2. Per Capita Monthly Expenditure on Various Expenditure Categories, by Expenditure Classes, India, 1964-65	8
3. Division of Incremental Expenditure Among Expenditure Categories, by Rural Expenditure Class, India, 1964-65 . .	9

*Summary of presentation at the Agricultural Policy Seminar, AID-USDA, Washington, D.C., June 25, 1974.

POPULATION, RESOURCES AND JOBS

A SUMMARY STATEMENT

John W. Mellor

Introduction

The relationship between population growth, the resource base and employment growth is complex and interacting. Rapid population growth increases the demand for fixed resources, thereby bringing into use successively less and less productive resources and declining productivity of labor and capital. The result is downward pressure on per capita income. Perhaps even more important, population growth fosters relative scarcity of fixed capital which in turn is associated with increasing unemployment. But, we also find that increasing the productivity of resources and increased employment are important and perhaps necessary conditions of decreasing birth rates and hence of decreasing rates of population growth.

In this presentation, I emphasize these interactions and indicate how they may become the basis for a rising cycle of growth rather than a vicious circle of poverty. I first point out the nature of the natural resource drains arising from population growth and comment on means of reducing their amount and importance. I then treat the pressure of population growth on capital resources and the means of reducing that pressure. Finally, I treat the effect of income growth and distribution on population growth, point out the dilemma inherent in this relationship and indicate the basis for using that relationship to accelerate growth.

Population Growth and Resource Productivity

Population growth without an increase in employment and income places little additional burden on resources. Existing income is simply redistributed over a larger population with a decline in average per capita income. The decline in income largely balances the demand effect of increased population size. As average incomes decline, there is some change in consumption patterns towards the more subsistence oriented commodities and consequent increase in demand for agricultural commodities.

Much more substantial, however, is the effect of accompanying population growth with commensurate increases in employment so that incomes are maintained. In that case, demand for various commodities initially increases proportionately with population growth with, of course, a major weight to agricultural commodities (See Tables 1, 2, 3). If, concurrently, employment were to expand more than proportionately to population growth, then per capita incomes of the lower income classes will expand with increased per capita employment. Again, the pressure of added expenditure will be heavily on the agricultural sector. Thus, population growth places particular pressure on agricultural production resources and the greater the accompanying employment content the greater that pressure on agriculture.

It is the fixity of the agricultural land resource, accompanying diminishing returns to agricultural production inputs and consequent rising costs that create the underlying problems of declining incomes in association with population growth.^{1/} It is technological change in agriculture which offers an escape from this trap.^{2/}

^{1/}For a discussion of the theory of this position see John W. Mellor, "Modernizing Agriculture and Theories of Economic Growth," in Agriculture in the Development of Low Income Nations, Nurul Islam (ed.), Macmillan and St. Martin's Press, London, (forthcoming).

^{2/}For a discussion of this point in a broad strategic framework see Uma J. Lele and John W. Mellor, "Jobs, Poverty and the Green Revolution," International Affairs, Vol. 48, No. 1, January, 1972.

Technological change of a yield increasing type -- the "green revolution" of high yielding crop varieties and practices -- acts to release the basic resource constraint of limited land area, to not only allow mobilization of low productivity labor for economic growth but to also reduce the short run strain of population growth. These forces, in association with longer term processes of growth and changing social values, may then reduce population growth rates. The requisites of yield increasing technological change in agriculture are themselves substantial.^{3/} They are basically a matter of institutions, staffed by trained manpower, for performing relevant research, extending the results to farmers, supplying purchased inputs, marketing output and building physical infrastructure. Research to provide new high yielding varieties of crops is the keystone upon which the rest of the structure is built.

Population Growth and Capital Supplies

Population growth places pressure on capital supplies by requiring that a given stock of capital be spread more thinly to cover an enlarged labor force and by reducing the capacity to save as decreased real income forces a higher proportion of income to consumption. The problem is perhaps most dramatically illustrated by education, for which a nation with rapid population growth must run very quickly just to maintain position with respect to proportions educated. However, the problem is equally severe for creation of the factories and machines for the jobs without which per capita income is depressed, further diminishing capacity to save, to invest and hence, to enlarge the capital stock.

^{3/} For a full exposition see John W. Mellor, The Economics of Agricultural Development, Cornell University Press, 1966; for an historical perspective on efforts to provide these requisites see, John W. Mellor, Thomas F. Weaver, Uma J. Lele, and Sheldon R. Simon, Developing Rural India: Plan and Practice, Cornell University Press, 1963.

Just as there is a means of diminishing the pressure of population growth and of growing employment on agricultural resources, so there is a means of reducing the pressure on capital resources -- and the two are complementary.

The labor intensity of production may be increased by changing the structure of domestic consumption and the volume and structure of international trade.^{4/} However, to increase labor intensity to conserve capital is to increase the relative demand for the wages goods which are dominantly agricultural. Thus to relieve the capital constraint requires relief of the land constraint through technological change. Conversely, in the context of a broadly participatory agriculture, the process of technological change in agriculture may increase net farm and national income and provide increased consumer demand for a wide range of relatively labor intensive goods and services such as textiles, consumer electronics and watches, as well as labor intensive agricultural commodities such as vegetables and livestock products (See Table 1, 2, 3). Thus, while agriculture provides the wages goods to back increased employment it is also providing the added income necessary to create demand for employment creating goods.

Income Growth, Distribution and Fertility

International comparisons of countries show that, in general, as per capita incomes rise national birth rates decline. This is a result of changing aspirations, potentials to realize aspirations and costs of child-rearing. Just as there is a central tendency among nations for declining birth rates to be associated with rising

^{4/}

For a discussion of the changes in domestic consumption structure see, John W. Mellor and Uma J. Lele, "Growth Linkages of the New Foodgrain Technologies," Indian Journal of Agricultural Economics, Vol. XXVIII, No. 1, Jan.-Mar. 1973; for discussion of the role of trade in reducing capital intensity, see John W. Mellor and Uma J. Lele, "The Interaction of Growth Strategy, Agriculture and Foreign Trade -- The Case of India," in Trade, Agriculture and Development, George S. Tolley (ed.), Ballinger, (forthcoming).

incomes, so there is a similar tendency within nations. Thus, if participation in growth is restricted to a narrow segment of the population so declines in fertility are restricted to a narrow segment of the population.

Since a condition of broad participation in growth is increased employment, so a necessary condition of general decline in birth rates is growth in employment. That, in turn, requires growth in food supplies which can only occur as technological change breaks the land constraint. Thus, we close the circle of the relationship between population gains, resources and employment. If population growth is to be substantially reduced there must be broad participation in growth, that requires increased employment, with consequent increase in the demand for food. That increased demand for food can only be met by technological change in agriculture which, in turn, also increases incomes to provide demand and financing for employment creating jobs.

A series of problems arise in executing the program requisite to declining fertility. Most important, there is a likely lag between decline in birth rates and the decline in death rates which is an inevitable associate of the increased income, values and life style necessary to eventual decline in birth rates. It is that temporary divergence between birth rates and death rates which creates a period of great pressure on land resources and a test of the potential for technological change in agriculture - perhaps at an early stage in growth when the institutions for providing such technological change are themselves in an untested infancy.

This set of problems may then develop into a race between population growth and technological change, with a lead for the latter being necessary to a decline in growth of the former.

Policies for Control of Population and Growth of Employment

It should be clear that there is no long-run conflict between policies of population control and policies of employment growth. The latter is a condition of the former. However, a further condition is that resource constraints be relaxed in the short run by technological change in agriculture.

Thus, the first policy for reduced fertility is development of that set of institutions for research, extension and input supply necessary to increased resource productivity in agriculture.

The second policy is an expansion of employment to provide the market for those agricultural commodities. That expansion in employment can be achieved by growth in demand for labor intensive consumer goods, many of which are agricultural commodities such as vegetables and livestock commodities as well as manufactured consumer goods such as textiles, electronic and simple vehicles. This expansion requires appropriate allocation of resources and facilitative institutions.

Third, in the environment of broad participation in employment growth, programs are needed and may be effective for increasing education for employment, improved health and nutrition. In this context programs to educate with respect to birth control techniques can effectively accelerate decline in birth rates.

Table 1. Average Propensity to Expend (APE) on Various Expenditure Categories, by Expenditure Classes, India, 1964-65.

Decile	Bottom 2	3rd	4th & 5th	6th, 7th	9th	Lower $\frac{1}{2}$	Upper $\frac{1}{2}$	Mean for all classes
	deciles	decile	deciles	& 8th deciles	decile	of 10th decile	of 10th decile	
	(less than 0.49 acres)	(0.50- 0.99 acres)	(1.00- 4.99 acres)	(5.00- 9.99 acres)	(10.00- 14.99 acres)	(15.00- 29.99 acres)	(30.00+ acres)	
<u>Per capita monthly consumer expenditure (Rs.)</u>	8.93	13.14	17.80	24.13	30.71	41.89	85.84	24.43
<u>APE on</u>								
1. Food grains	0.54	0.52	0.47	0.40	0.34	0.27	0.15	0.39
2. Milk & milk products	0.02	0.04	0.06	0.08	0.09	0.10	0.10	0.08
3. Meat, eggs & fish	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.02
4. Other foods	0.13	0.10	0.09	0.09	0.09	0.09	0.12	0.09
5. Tobacco	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02
6. Vanaspati	@	@	0.01	0.01	0.01	0.01	0.01	0.01
7. Other oils	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03
8. Sweetners	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.04
9. Cotton textiles	0.05	0.06	0.07	0.07	0.07	0.06	0.05	0.07
10. Woolen textiles	@	@	@	@	@	@	0.01	@
11. Other textiles	@	@	@	@	@	@	0.01	@
12. Footwear	@	@	@	@	@	@	0.01	@
13. Durables & semi- durables	@	@	@	0.01	0.01	0.02	0.03	0.01
14. Conveyance	@	0.01	0.01	0.01	0.02	0.02	0.05	0.01
15. Consumer services	0.01	0.01	0.02	0.02	0.02	0.03	0.04	0.02
16. Education	@	0.01	0.01	0.01	0.02	0.02	0.05	0.01
17. Fuel & light	0.06	0.07	0.07	0.06	0.06	0.06	0.04	0.06
18. House rent	@	@	@	0.01	0.01	0.02	0.04	0.01
19. Miscellaneous ^{a/} (approx.)	0.09	0.07	0.08	0.11	0.15	0.18	0.21	0.11

@Negligible

^{a/} Estimated as a residual

Source: Estimated from functions fitted to data from NCAER, All-India Consumer Expenditure Survey, 1964-1965, Vol. II, New Delhi, 1967. See Appendix Table 6, p. 33, from, "Analysis of Consumption Expenditure Patterns in India," by B. M. Desai, Occasional Paper No. 54, Dept. of Agr. Econ. Cornell Univ.-USAID Employment & Income Distribution Project, August, 1972.

Table 2. Per Capita Monthly Expenditure on Various Expenditure Categories, by Expenditure Classes, India, 1964-65.

	Bottom 2 deciles	3rd decile	4th & 5th deciles	6th, 7th & 8th deciles	9th decile	Lower $\frac{1}{2}$ of 10th decile	Upper $\frac{1}{2}$ of 10th decile	Mean for all classes
	(less than 0.49 acres)	(0.50- 0.99 acres)	(1.00- 4.99 acres)	(5.00- 9.99 acres)	(10.00- 14.99 acres)	(15.00- 29.99 acres)	(30.00+ acres)	
<u>Per capita monthly consumer expenditure (Rs.)</u>	8.93	13.14	17.80	24.13	30.71	41.89	85.84	24.43
<u>Monthly per capita expenditure on</u>								
1. Food grains	4.83	6.84	8.31	9.58	10.45	11.37	12.80	9.58
2. Milk & milk products	0.19	0.58	1.13	1.94	2.79	4.15	8.58	1.98
3. Meat, eggs & fish	0.10	0.22	0.36	0.56	0.76	1.08	2.20	0.57
4. Other foods	1.19	1.34	1.64	2.16	2.78	3.98	10.16	2.19
5. Tobacco	0.19	0.25	0.32	0.39	0.47	0.59	1.00	0.40
6. Vanaspati	0.01	0.04	0.11	0.23	0.36	0.59	1.25	0.23
7. Other oils	0.14	0.34	0.56	0.81	1.02	1.28	1.84	0.82
8. Sweetners	0.16	0.36	0.58	0.85	1.08	1.40	2.17	0.86
9. Cotton textiles	0.47	0.84	1.20	1.64	2.04	2.63	4.34	1.66
10. Woolen textiles	@	0.01	0.03	0.06	0.11	0.20	0.79	0.06
11. Other textiles	@	0.01	0.01	0.02	0.04	0.09	0.66	0.02
12. Footwear	@	0.06	0.10	0.15	0.21	0.30	0.59	0.16
13. Durables & semi- durables	0.07	0.11	0.17	0.27	0.40	0.68	2.45	0.28
14. Conveyance	0.04	0.09	0.16	0.30	0.49	0.94	4.12	0.30
15. Consumer services	0.11	0.19	0.30	0.48	0.68	1.09	3.19	0.48
16. Education	0.04	0.08	0.15	0.29	0.49	0.94	4.33	0.30
17. Fuel & light	0.57	0.89	1.19	1.56	1.89	2.37	3.82	1.57
18. House rent	@	0.02	0.05	0.15	0.30	0.69	3.38	0.15
19. Miscellaneous ^{a/} (approx.)	0.82	0.87	1.43	2.71	4.35	7.52	18.17	2.72

@Negligible

a/ Estimated as a residual

Source: Estimated from functions fitted to data from NCAER, All-India Consumer Expenditure Survey, 1964-65, Vol. II, New Delhi, 1967. Op. cit., Appendix Table 7, p. 34.

Table 3. Division of Incremental Expenditure Among Expenditure Categories, by Rural Expenditure Class, India, 1964-65.

	Bottom deciles (mainly landless ag.& nonag. laborers)	3rd decile (laborers with less than 1 acre)	4th & 5th deciles (1-5 acres)	6th, 7th & 8th deciles (5-10 acres)	9th decile (10-15 acres)	Lower $\frac{1}{2}$ of 10th decile (15-30 acres)	Upper $\frac{1}{2}$ of 10th decile (30+ acres)
<u>Mean Per Capita Monthly Expenditure</u>	8.93	13.14	17.80	24.13	30.71	41.89	85.84
<u>Allocation of an Additional Rupee</u>							
<u>of Expenditure</u>							
A. Agricultural Commodities	0.79	0.69	0.59	0.52	0.46	0.40	0.33
(a) Food grains	0.59	0.38	0.25	0.16	0.11	0.06	0.02
(b) Nonfoodgrains	0.20	0.31	0.34	0.36	0.35	0.34	0.31
(i) Milk & Milk products	0.07	0.11	0.12	0.13	0.13	0.12	0.09
(ii) Meat, eggs & fish	0.02	0.03	0.03	0.03	0.03	0.03	0.02
(iii) Other foods (a)	0.01	0.05	0.07	0.09	0.10	0.12	0.16
(iv) Tobacco	0.01	0.01	0.01	0.01	0.01	0.01	0.01
(v) Vanaspati	-	0.01	0.02	0.02	0.02	0.02	0.01
(vi) Other oils	0.05	0.05	0.04	0.04	0.03	0.02	0.01
(vii) Sweetners	0.04	0.05	0.05	0.04	0.03	0.02	0.01
B. Nonagricultural Commodities	0.21	0.31	0.41	0.48	0.54	0.60	0.67
(a) Textiles	0.09	0.08	0.07	0.08	0.07	0.06	0.07
(i) Cotton textiles	0.09	0.08	0.07	0.06	0.06	0.05	0.03
(ii) Woolen textiles	-	-	-	0.01	0.01	0.01	0.02
(iii) Other textiles	-	-	-	0.01	-	-	0.02
(b) Nontextiles	0.12	0.23	0.34	0.40	0.47	0.54	0.60
(i) Footwear	-	0.01	0.01	0.01	0.01	0.01	0.01
(ii) Durables & semidurables (b)	0.01	0.01	0.01	0.02	0.02	0.03	0.05
(iii) Conveyance (c)	0.01	0.01	0.02	0.02	0.03	0.05	0.10
(iv) Consumer services (d)	0.02	0.02	0.02	0.03	0.03	0.04	0.06
(v) Education (e)	0.01	0.01	0.02	0.03	0.03	0.05	0.11
(vi) Fuel & light	0.07	0.07	0.06	0.05	0.05	0.04	0.03
(vii) House rent (f)	-	0.01	0.01	0.02	0.03	0.04	0.08
(viii) Miscellaneous (g)	-	0.09	0.16	0.22	0.27	0.28	0.16
TOTAL	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: See B. M. Desai, "Analysis of Consumption Expenditure Patterns in India," Occasional Paper No. 54
Department of Agricultural Economics, Cornell University USAID-Employment & Income Distribution Project
August, 1972.