

**PLANNING MODELS
FOR
POVERTY ALLEVIATION**

By

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ABSTRACT

An attempt has been made in this paper to highlight first the plan strategies so far adopted and the models constructed for poverty alleviation in India. As is known, no significant results could be achieved so far in India in poverty alleviation. It is also feared that the current liberalisation may not by itself offer the necessary improvements in poverty alleviation with a reasonable speed in the next, say, two decades or so.

In view of this background, the paper then emphasizes that there is an urgent need to work out more effective strategies and offers a combination of strategies for India. One of the most important components of the strategies suggested here relates to the basic needs approach to development as originally proposed by ILO (ILO, 1976, 1977), and the model for this as worked out by Herrera Amilcar O. et al (IDRC, Canada, 1976). A few relevant models already constructed in India, such as, those by Sinha R et al (1979), Dhar & Rao (1983a & 1983b), and, Dhar, Rao & Goel (1991a, 1991b & 1993) have been briefly discussed here.

It is further suggested here that planning for poverty alleviation and liberalisation for industrialization should be used in combination to get the best results for poverty alleviation as well to strengthen liberalisation efforts. Two alternative projections, one as Alternative I showing only liberalisation without any planning and the other as Alternative II with liberalisation with planning have been worked out here. Projections have been provided for the rate of growth of per capita income and its distribution during the next two decades, 1995-2005 & 2005-2015. Following the assumptions of this approach, Alternative II indicates better results both in income growth as well as its distribution.

The paper has also provided a framework of a micro level planning and implementation design for effective planning for poverty alleviation.

The above approach is, no doubt, feasible from the point of view of availability of all physical and financial resources; however, the paper is silent about its political feasibility. Things do not remain static all the time, and there may be political compulsions in future to adopt strong measures for poverty alleviation as suggested in this paper.

PLANNING MODELS FOR POVERTY ALLEVIATION.

Ranajit Dhar*

1. Introduction :

Developing countries suffer from absolute poverty of the majorities while the industrialized countries face less acute problems of relative poverty of the minorities. The industrialized countries have high per capita income, high tax revenues and practically no scarcity of the availability of basic needs. The existing high inequality and the problems of relative poverty can be substantially redressed by adopting appropriate fiscal measures of income redistribution. On the contrary, the developing countries have low per capita income, low tax revenues and acute scarcity of availability of basic needs. These countries thus have much less to redistribute. Solution lies in achieving high growth of both output and employment.

Take the case of India. It started its development efforts as early as 1950s. So far, it could achieve only a low rate of growth of per capita income. Employment elasticities (with respect to output growth) were much less than unity. Employment generation therefore, fell short of output growth. Due to the existence of high inequality in the distribution of initial income and wealth the market tended to neglect the production of basic needs required by the poor causing supply scarcities of these items and consequent increase in their prices. The government failed to invest sufficiently in human development efforts in providing enough nutrition, education, health and habitat for all. As a consequence the productivity and income of the poor remained very low. The prices of basic needs were, therefore, higher compared to the purchasing power of the poor.

At the social level there is practically no general consciousness towards sharing the fruits of development more equitably among the various income groups. The dominant trend is to exploit the weak by the economically stronger groups. This has substantially choked the process of growth. The political and bureaucratic support necessary for bringing about the necessary socio-political changes in support of the cause of the poor are also not very effective. It may be pointed out here that In the East Asian countries like the

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Republic of Korea, Taiwan etc. social, political and bureaucratic support for achieving high growth with equity were very significant and that is why, in conjunction with the adoption of many other relevant strategies, these countries could achieve miracles.

In the light of the above, an effective poverty alleviation programme in India should essentially cover the following strategies in combination:

1. Ensuring adequate availability of basic needs;
2. Increasing the productivity of the poor;
3. Rapid employment generation;
4. Prices of basic needs in line with the purchasing power of the poor;
5. Redistribution of income and wealth;
6. Incentives for population control;
7. Development of strong Social awareness towards sharing the fruits of growth more equitably; and,
8. Effective Political and Bureaucratic support for the cause of the poor.

The strategy of ensuring availability of basic needs will require substantial changes in the production system. It should give top priority to the production of basic needs along with fixing 'Social maximum' for certain non-basic items, wherever necessary, for appropriately channeling the necessary resources.

Increasing the productivity of the poor will require higher investments in human development in improving Nutrition, Education, Health and Habitat (UNDP, Human Development Report).

Rapid employment generation, both wage employment and self employment, can be ensured by encouraging employment generating activities. Further, with availability of basic needs ensured, a programme of providing unemployment benefits can easily be made quite effective.

An appropriate income and pricing policy simultaneously with changes in the distribution of income and wealth will ensure prices of basic needs commensurate with the purchasing power of the poor.

Improving the living standards of the poor will go a long way in population control of the poor. Extra income incentives will help to speed up population control.

The above package of strategies will definitely help in achieving speedy poverty alleviation in the developing countries in general and in India in particular.

In section 2 a review of poverty alleviation models will

be provided. In section 3 the role of planning for poverty alleviation along with industrial liberalisation will be discussed and in section 4 a framework of a proposed micro model for poverty alleviation at the regional levels is discussed. In the last section 5 a brief summary and conclusions will be provided.

2. Poverty Alleviation Models.

a. Basic Needs Approach to Development. ILO, 1976, 1977.

The outline of the Basic Needs Approach to Development was first prepared by ILO (ILO, 1976, 1977).

The basic needs include Adequate Food, Shelter, Clothing, Certain Housing Equipments and Furniture. Also included are Essential Services such as Safe Drinking Water, Sanitation, Transport, Health and Educational Facility.

This approach also implies the participation of the people in making decisions which effect them. In a broader framework it will include fulfillment of basic human rights.

b. Catastrophe or New Society ? A Latin American World Model. Herrera Amilcar O. et al, 1976.

'Catastrophe or New Society? A Latin American World model' was developed by Amilcar O. Herrera and others (IDRC-064e, 1976) with the goal of 'liberating the world from underdevelopment and misery'.

The 'mathematical model is based on the premise that, ... the production has the satisfaction of basic human needs as a main objective'.

The purpose of constructing this model was to test the material viability with current economic resources in the foreseeable future, and, does not sufficiently prove that the social structure necessary to achieve these goals are also possible.

The sectoral classification of this model corresponds to basic needs. The basic needs sectors considered in the model are i) Nutrition (Calories and Proteins), ii) Housing (Number of Dwellings), iii) Education (Places available with the first 12 years of Schooling) and iv) Health. To cover the rest of the activities of the economy two other sectors, namely, v) Capital Goods and, vi) Consumer Goods and Other Services were also considered.

As regards the regional groupings of this model i) All Developed Countries covering USA, UK and Europe have been

grouped as one, while the Developing Countries were grouped into three continents, namely, ii) Latin America, iii) Africa and iv) Asia.

For each production sector, the output levels are determined by Cobb-Douglas Production Function with only two inputs namely, i) Labour and, ii) Capital. The effects of Technological Progress, and International Trade were also considered in the model.

The model is solved with the objective of Maximizing the Life Expectancy at birth at each point in time. Suitable constraints and conditions on the satisfaction of basic needs and other factors were considered in the model. The model was solved using a special Nonlinear Optimisation Algorithms.

The base year of the model was 1960. The model was validated comparing actual and projected values for 1970. All projections were worked out starting with 1980.

The results of the model indicate that if the policies proposed in the model are applied, it will be possible to provide all humanity with an adequate standard of living within a little over one generation.

c. A Technical Note on the Approach to the Fifth Plan of India. Planning Commission, Government of India, 1973:

Planning Commission, Govt. of India, New Delhi, studies as part of the construction of Five Year Plan models the problems of poverty alleviation. For example, A Technical Note on the Approach to the Fifth Plan of India (Planning Commission, 1973) developed a multi-sectoral consistency model. A separate consumption sub-model was used for this model to work out the required consumption vector for given targets of reduction of poverty as well as inequality. Finally, the changes in the composition of outputs as a result of the planned changes in consumption goals are then worked out. The similar strategies were adopted in the subsequent Five Year Plans also.

The results indicate that the targets set for poverty alleviation in the Five Year Plans were too insufficient in relation to the vast magnitude of poverty existing in India. There were snags also in the implementation of the programmes.

Planning Commission strategies did not, therefore, bring about any perceptible improvements in poverty alleviation.

- d. **Income Distribution, Growth and Basic Needs in India.**
Sinha R, Peter Pearson, Gopal Kadakodi and Mary Gregory,
1979.

In the Indian context an elaborate study was conducted by Sinha et al (1979) titled 'Income Distribution, Growth and Basic Needs in India'. They have developed a macro-economic model of income distribution using a multi-sectoral consistency model. The model used can be described with the following equations :

$$1. X = AX + F$$

$$2. X = (I - A)^{-1} . F$$

$$3. N = eX$$

Where, X = Gross Output (Column Vector) ;

F = Final Demand (Column Vector) ;

A = Matrix of Technical Coefficients ;

N = Employment by Industry ;

e = Row Vector of the number of persons employed per unit of Gross Output ;

In order to incorporate income/expenditure distribution into the model the consumption vector in the final demand has been broken down into number of different income groups. Similarly, sectoral value added data also has been broken down into different income/expenditure classes.

The model is solved under different assumptions of distribution of income and expenditure across different income classes.

The 'analysis and simulation results all confirm that the key to the low income status of the poor is the invariably low share accruing into them from income generation'. Therefore, 'manipulation of the structure of output, whether through income redistribution, fiscal measures or otherwise, can bring, at best, only a marginal improvement in their relative position'. Therefore, there is a need for direct measures to improve the share of the poor.

The conclusion of the model is that 'it is growth coupled with redistribution in favour of the poor that the conditions of the poor can be improved'.

e. **EMPOV (Employment and Poverty) Model. R Dhar and MR Rao, 1983.**

Dhar and Rao (1983a) have developed an alternative model known as "EMPOV (Employment and Poverty) Model". While the conceptual framework of the model is based essentially on the concept of basic needs, the structure and functioning of the model is more comprehensive compared to the various models discussed above.

The model is helpful in analysing the problems of acute poverty and unemployment in the developing countries and seeks to study the material feasibility of achieving the goal of poverty alleviation in the shortest possible time frame.

This model is developed for a regional economy within the framework of a national economy. Empirical analysis of the model is conducted with the data of Bangalore district, Karnataka state, India.

Each regional economy is divided into 13 sectors. These sectors are as follows :

- | | |
|------------------------|---------------------------|
| 1. Foodgrains ; | 8. Metals & Engineering ; |
| 2. Other Agriculture ; | 9. Other Industries ; |
| 3. Mining ; | 10. Electricity ; |
| 4. Textiles ; | 11. Construction ; |
| 5. Chemicals ; | 12. Transport ; and, |
| 6. Petroleum ; | 13. Services. |
| 7. Cement ; | |

The basic needs sectors are i) Food, ii) Clothing, iii) Housing, iv) Health, v) Education and, vi) Certain Basic Entertainments (Sports, Cultural Activities etc.). However, for difficulties of data it was not possible to consider the basic needs sectors separately. In the empirical study for Bangalore the basic needs of Food is considered in Foodgrains and Other Agricultural sectors, Clothing in the Textiles sector, Housing in Construction sector, and the rest of the basic needs, such as, Health, Education and Basic Entertainments are all considered in the Services sector.

The sectors Metals and Engineering and the Other Industries mostly cover non-basic items of semi-luxury and luxury goods.

It is a multi-sectoral optimising model.

We have used the following notations.

The index u is used to denote the years which are numbered consecutively from 0 to T where 0 denotes the base year and T is the number of years considered in the model.

Further, T is identified as the year when full employment can be reached. Either of the indices i & j denotes the sectors which are numbered consecutively from 1 to n .

The variables below are defined in Rupee terms:

Let, $X_{i,u}$ = output of sector i in year u
 $K_{i,u}$ = capacity of sector i in year u
 $M_{i,u}$ = imports in sector i during year u
 $X_{i,j,u}$ = output of sector i used in sector j as current inputs in year u
 $S_{i,j,u}$ = as capital inputs in year u
 $INV_{i,u}$ = inventory demand in sector i , year u
 $C_{i,u}$ = consumption of output of sector i in year u
 $E_{i,u}$ = exports of output of sector i in year u
 $RI_{i,u}$ = replacement investment demand in sector i , year u

The Objective Function.

The objective of the model is to maximise employment at each point in time and find out the earliest time when full employment can be achieved.

This can be written as follows:

$$E_T = \text{Max.} \sum_{i=1}^n \theta_{i,T} \cdot X_{i,T}$$

where,

$X_{i,T}$ = Output levels, sector i , period T ;

$\theta_{i,T}$ = Employment norms indicating number of persons required per unit of output levels, sector i , period T .

Employment function may quite likely be non-linear, but here a linear function has been assumed for the sake of simplicity of calculations.

No distinction has also been made at this stage between skill groups.

The constraints considered in this model are as follows :

Supply-Demand Equations.

Total Supply = Total Demand.

This balance equation for each sector in each year is given by

$$X_{iu} + M_{iu} = \sum_{j=1}^n X_{ijsu} + \sum_{j=1}^n S_{ijsu} + INV_{iu} + RI_{iu} + C_{iu} + E_{iu}$$

...(1)

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

Now, $x_{ijsu} = a_{ijsu} \cdot X_{jsu}$ where,

a_{ijsu} = output of sector i required as current input per Rupee output of sector j during year u

$S_{ijsu} = b_{ijsu} \cdot (K_{j,u+\theta_j} - K_{j,u+\theta_j-1})$ where,

b_{ijsu} = output of sector i required as capital input per Rupee of incremental capacity of sector j during year u

θ_j = gestation lag in sector j and

$K_{jt} = K_{jT} \cdot (1 + \beta_j)^{t-T}$ for $t > T$

where β_j = post terminal growth rate in capacity for sector j

$INV_{iu} = GAMA_{iu} \cdot (X_{iu} - X_{i,u-1})$ where,

$GAMA_{iu}$ = inventory coefficient for sector i , year u

$RI_{iu} = RI_{i0} (1 + GRRRI_i)^u$ where,

$GRRRI_i$ = growth rate of replacement investment in sector i

Now, substituting for x_{ijsu} , S_{ijsu} , INV_{iu} and RI_{iu} from definitions above, collecting terms and, writing the variables to be determined on the left hand side, we have the supply-demand equation as

$$\begin{aligned} (1 - a_{i1iu} + GAMA_{iu}) \cdot X_{iu} - \sum_{j \neq i}^n a_{ijsu} \cdot X_{jsu} - GAMA_{iu} \cdot X_{i,u-1} \\ - \sum_j b_{ijsu} \cdot (K_{j,u+\theta_j} - K_{j,u+\theta_j-1}) - C_{iu} - E_{iu} + M_{iu} \end{aligned}$$

$$= RI_{1u} (1+GRRRI_1) \quad \dots(2)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

Output Restrictions.

The output of a sector in any year should not exceed the capacity of that sector in the same year. This set of constraints is written as

$$X_{1u} \leq K_{1u} \quad \text{or}$$

$$(X_{1u} - K_{1u}) \leq 0 \quad \dots(3)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

The output of a sector in a year is restricted to be at least a certain percentage of the previous year's output of the same sector. This is given by

$$X_{1u} \geq (\text{PROUT}) \cdot X_{1,u-1} \quad \text{or,}$$

$$\{ X_{1u} - (\text{PROUT}) \cdot X_{1,u-1} \} \geq 0 \quad \dots(4)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

where PROUT is the pre-specified percentage expressed as a fraction between 0 and 1. Note that if PROUT = 0, inequality (4) reduces to the non-negativity constraints which are implied in any linear programming problem. If PROUT = 1, the inequality (4) implies that the output should be non-decreasing over time.

Capacity Restrictions

The restriction that the capacity in a sector should be non-decreasing over time is written as

$$K_{1u} \geq K_{1,u-1} \quad \text{or,}$$

$$\{ K_{1u} - K_{1,u-1} \} \geq 0 \quad \dots(5)$$

$$\text{for } i = 1, 2, \dots, n$$

$$u = 1, 2, \dots, T$$

Two different types of upper bounds for capacity of each sector and each year have been assumed.

One type is called technological constraints, and the others as policy constraints.

Technological constraints provide data on maximum possible capacity that can be achieved based on availability of physical and financial resources, limitations of technological and managerial factors etc. for each sector and each year. This only means that there are limits to the potential capacity growth of each sector in each period.

The policy constraints indicate that although based on the technological factors as above higher growth is possible, it may become necessary to restrict as a policy the growth of certain non-basic sector capacities below the level of the full capacity potential as and when the resources necessary for the development of basic needs items conflict with those of the non-basic needs items. This is essential to provide priority to the production of basic needs. ILO has designated this as 'social optimum'.

The increase in capacity from one year to the next is therefore, restricted as follows:

$$K_{i,u} \leq (1 + f_i) \cdot K_{i,u-1} \quad \text{or,}$$

$$\{ K_{i,u} - (1 + f_i) \cdot K_{i,u-1} \} \leq 0 \quad \dots(6)$$

for $i = 1, 2, \dots, n$
 $u = 1, 2, \dots, T$

where f_i = pre-specified maximum annual growth rate in capacity for sector i

Investment Constraints

The upper limits on aggregate investment for each of the years can be fixed based on the expected availability of capital resources. The past performance and the prospects for improvements in future will act as a guide in this.

The allocation of investment in each of the sectors would depend on demand, and, the nature of intersectoral relationships across the sectors as well as over time.

The upper limit on the aggregate net fixed investment in any year is given by

$$\sum_{i,j} b_{ij} \cdot (K_{j,u+1} - K_{j,u+1-1}) \leq (\text{BNFI}) (1+w)^u \quad \dots(7)$$

for $i = 1, 2, \dots, n$
 $u = 1, 2, \dots, T$

where BNFI = base year net fixed investment

w = annual growth rate in net fixed investment

The aggregate net fixed investment in any year is further restricted to be at least a certain specified percentage of the previous year's net fixed investment. This set of constraints is written as

$$\sum_{i,j} b_{ij} \cdot (K_{j,u+1} - K_{j,u+1-1}) \geq (\text{PRINV}) \cdot \sum_{i,j} b_{ij} \cdot (K_{j,u+1-1} - K_{j,u+1-2})$$

$$\text{or, } \sum_{i,j} (b_{ij} \cdot K_{j,u+1} - (1+\text{PRINV}) \cdot b_{ij} \cdot K_{j,u+1-1} +$$

$$(\text{PRINV}) \cdot b_{ij} \cdot K_{j,u+1-2}) \geq 0 \quad \dots(8)$$

for $u = 2, 3, \dots, T$

for $u = 1$, this constraint becomes

$$\sum_{i,j} b_{ij} \cdot (K_{j,1} - K_{j,0}) \geq (\text{PRINV}) \cdot (\text{BNFI})$$

where PRINV is the pre-specified percentage expressed as a fraction, between 0 and 1. Note that if $\text{PRINV} = 0$, the constraints (8) can be dropped since the capacity in any sector is non-negative and non-decreasing over time as implied by the constraints (5). If $\text{PRINV} = 1$, the constraints (8) imply that the aggregate net fixed investment should be non-decreasing over time.

Net Imports Restriction

To arrest the tendency of aggregate imports far exceeding aggregate exports for each year, upper limits have been fixed for this. This has been done to give preference to domestic production and employment generation.

These constraints are written as under :

$$\sum_1 M_{1u} - \sum_1 E_{1u} \leq D_u \quad \dots(9)$$

for $u = 1, 2, \dots, T$

where D_u = pre-specified upper limit for net aggregate imports in year u

Export and Import Restrictions

Based on past performance and the prospects for improvements upper limits are fixed for both exports and imports. The idea is to have a reasonable amount of consistency in the pattern of interregional trade.

The exports from a sector in a year is restricted to be at least a certain pre-specified percentage of the previous year's exports from the same sector. This is expressed as

$$E_{1u} \geq (\text{PREXP}) \cdot E_{1,u-1}$$

or,

$$(E_{1u} - (\text{PREXP}) \cdot E_{1,u-1}) \geq 0 \quad \dots(10)$$

$$\text{for } i = 1, 2, \dots, n$$

$$u = 1, 2, \dots, T$$

where PREXP is the pre-specified percentage expressed as a fraction between 0 and 1.

Note that if PREXP = 0, constraints (10) reduce to non-negativity restrictions which are implied in any case. If PREXP = 1, the exports from a sector should be non-decreasing over time.

In addition, for each year an upper bound constraint is imposed on the exports from a sector, i.e.

$$E_{1u} \leq E_{10} \cdot (1+e_1)^u \quad \dots(11)$$

$$\text{for } i = 1, 2, \dots, T$$

$$u = 1, 2, \dots, T$$

where e_1 = pre-specified maximum annual growth rate in exports for sector i

The constraints on imports are similar to the constraints on exports. These constraints are

$$M_{1u} \geq (\text{PRIMP}) \cdot M_{1,u-1}$$

or,

$$(M_{1u} - (\text{PRIMP}) \cdot M_{1,u-1}) \geq 0 \quad \dots(12)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

$$\text{and } M_{1u} \leq M_{10}(1+m_1)^u \quad \dots(13)$$

where, PRIMP = pre-specified percentage expressed as a fraction between 0 and 1

and, m_1 = pre-specified maximum annual growth rate in imports for sector i

As in the case of exports, if PRIMP = 0, constraints (13) reduce to non-negativity constraints. If PRIMP = 1, the imports in a sector are to be non-decreasing over time. Provision has also been made in the model to include new exports/imports for which there are no exports/imports in the base year .

Consumption Constraints

Both upper and lower limits are specified for consumption.

The lower limits are fixed based on the following considerations :

- a. Minimum per capita consumption goal has been assigned for each sector, rising over time due to population increases only.
- b. Each sector is assigned an annual rate of growth, maximum possible rate in the case of the basic needs, and lower than the maximum possible rate for the non-basic needs sectors.

Per capita consumption will grow at the specified rates till the minimum per capita goal is achieved, and after that it will grow only at the rate at which the population is growing. This growth path will provide the lower limits.

The upper limits will be higher compared to the lower limits by certain fixed percentage of the lower limits.

The per capita consumption in any sector is to be

non-decreasing over time. This is written as

$$(C_{iu} / P_{iu}) \geq (C_{i,u-1} / P_{u-1})$$

or,

$$\{ C_{iu} - (P_u / P_{u-1}) \cdot C_{i,u-1} \} \geq 0 \quad \dots(14)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

where P_u is the estimated population in year u . The population estimation for each year is done exogenously.

In addition, lower and upper bound constraints are imposed for the consumption variables. Thus

$$C_{iu} \geq CL_{iu} \quad \dots(15)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

where $CL_{iu} = (P_u) \text{ Min. } [R_{i0} \cdot (1 + v_i)^u ; R_i^*]$

R_{i0} = base year per capita consumption in sector i

v_i = specified annual growth rate in per capita consumption for sector i

R_i^* = target minimum per capita consumption for sector i

CL_{iu} = lower limit of sectoral consumption, year u

$$\text{Furthermore, } C_{iu} \leq CU_{iu} \quad \dots(16)$$

$$\begin{aligned} \text{for } i &= 1, 2, \dots, n \\ u &= 1, 2, \dots, T \end{aligned}$$

where $CU_{iu} = CL_{iu} \cdot (1 + z_i)$

with z_i = pre-specified non-negative value

Note that $z_i = 0$ implies that for sector i the lower limit equals the upper limit in each year, i.e.

$$C_{iu} = CL_{iu} = CU_{iu}$$

for $u = 1, 2, \dots, T$

In other words, if $z_i = 0$, the consumption level for sector i in each of the years is to be fixed at the lower limit for that year.

Post terminal conditions.

Since we have assumed gestation lags between output and investment, and they may be anywhere between 1 to 5, it is essential to provide post terminal conditions of annual growth rates of output beyond the terminal year T , in order to estimate investments in the terminal year.

It has been assumed here in the present model that they will be the same as the upper limits of annual growth rates of capacities as assumed in the model for each of the sectors. It is also possible to fix up other set of targets so long as they are reasonable.

Solution of the model is obtained, taking X_{1u} , C_{1u} , E_{1u} and M_{1u} as variables, under equality and inequality constraints and upper and the lower bounds for all the variables as mentioned above in equations 1 through 16.

Results.

The model has provided number of useful information for policy decisions.

It indicates that if top priority is given to the production of basic needs simultaneously restricting the rate of growth of non-basic items, it will be possible to make substantial progress in both employment generation and poverty alleviation within the span of a decade or so.

The model also provides other useful information regarding the annual investments required, sectoral production, consumption, trading relations, etc.

Like the Latin American model as discussed above this model also tests only the material feasibility of the basic needs approach to development and does not ensure the political feasibility of this approach. As regards implementation of this approach it is proposed that private initiative in implementing this scheme will be encouraged in all respects. In case of failure of private initiative government initiative and direct involvement will play a very vital role.

The EMPOV Model discussed here is an improvement over Sinha et al study (1979) in that it is a multisectoral

optimising model and is, therefore, able to consider various constraints in achieving the goals of speedy poverty alleviation in a more effective way.

This model is also an improvement over the Herrera and Others's (1976) study in that it considers top priority being given to the availability of basic needs. As a result the achievement is much faster compared to that of the Herrera and Others's model.

f. Other Models.

The EMPOV model only ensures the availability of basic needs. The study of poverty alleviation will not be complete without the analysis of corresponding income and pricing policy changes which will be necessary for balancing the supply of basic needs with demands. This has been done in a separate study by Dhar, Goel and Rao (1991b). This study is entitled as "EMPOV II Model". This model takes into consideration like that of Sinha's model consumption and value added broken down into income/expenditure classes. Price and income elasticities of consumption of each of the sectors have been assumed. In solving the model the non-linear model has been linearized using appropriate modifications.

Various alternative projections have been worked out with different combinations of price and income changes.

The results indicate that a combination of moderate doses of changes in both income and prices simultaneously will be necessary to achieve demand and supply balances once supply of basic needs are ensured.

Dhar, Rao and Goel (1991a) have also empirically tested the feasibility of the EMPOV model for the national economy as a whole with the same 13 sectors. Objective function of this model was maximisation of value-added treating employment goals, basic needs availability etc. as constraints. Useful results have been obtained regarding the production, consumption, trading and investment patterns necessary for speedy removal of poverty for the Indian economy as a whole. Here again it is observed that substantial progress can be achieved in about a decade or so. This national model was developed as part of analysis of a large system modelling. An elaborate user friendly software has also been developed for this model.

In an another study by Dhar, Goel and Rao (1993) a multiregional model was constructed using the EMPOV Model approach for the Indian economy for 2000 AD. Indian economy is divided into Five regions, and the same 13 sectors as in the case of EMPOV model were assumed. The objective function

was to maximise the weighted sum of value added for the economy as a whole. Appropriate constraints were used to make available basic needs in all the regions simultaneously on a top priority basis. Therefore, this model has endeavoured to reduce inter-regional disparity in the levels of development at least in respect of availability of basic needs.

The Table below provides information about the major differences between the current and the EMPOV strategies for the Indian economy.

| ITEMS | Existing Strategies. | EMPOV Model Strategies. |
|-------------------------------------|---|---|
| 1. Employment Generation | Special Schemes namely, IRDP, TRYSEM, DWCRA, NREP, RLEGS, JRY, EAS etc. are in operation. | The existing Schemes to be strengthened. |
| 2. Basic Needs Availability | No special emphasis given. | Top Priority to be given. |
| 3. Prices of Basic Needs. | PDS & Subsidies are in operation. | The existing Schemes to be Strengthened. |
| 4. Income Distribution. | No special emphasis given. | Income share of the poor must increase as a policy. |
| 5. Assets Generation of the poor. | Land Reforms were done in certain States. | This forms an important Strategy. |
| 6. Investment in Human Development. | Only moderate emphasis given. | Highest priority given. |
| 7. Credit Policy. | Special efforts given for larger flow of credit to the poor. | The existing Schemes to be strengthened. |
| 8. Time frame. | Mainly Short term. | Both Short & Long term. |

IRDP : Integrated Rural Development Programme;
 TRYSEM : Training of Rural Youth for Self-employment;
 DWCRA : Development of Women & Children in Rural Areas;
 NREP : National Rural Employment Programme;
 RLEGP : Rural Landless Employment Guarantee Programme;
 JRY : Jawahar Rojgar Yojana;
 EAS : Employment Assurance Scheme.

The current strategies suffer from number of basic weaknesses. Firstly, no special emphasis is given to the production/availability of basic needs. Secondly, adequate changes in the structure of incomes and prices have also not been contemplated. Thirdly, only a moderate emphasis is given to Human Development. As is known, all these act as important preconditions for the success of any poverty alleviation programmes. No wonder the current strategies which are based essentially on provision of employment and credit only have not shown significant progress in poverty alleviation. The current strategies appear to be essentially short term in nature. This has, however, helped so far in avoiding the situation to become too critical from the point of view of socio-political stability.

The EMPOV strategy on the other hand is sufficiently comprehensive and tries to cover most of these preconditions.

3. Liberalisation and Poverty Alleviation :

Liberalisation will initially be concentrated in the growth of production, consumption and trading of elite consumption goods where markets initially exist. It is only when these elite markets will get saturated the attention may be focussed on the growth of mass consumption goods to sustain high rate of development. When this starts happening the poor may expect to reap certain benefits of liberalisation.

The success of liberalisation, however, will depend on number of preconditions to be fulfilled. We earlier argued that during the second phase of liberalisation the economy will have to necessarily go into the production, consumption and trading of mass consumption goods. Firstly, the private initiative may not come in a big way for this as the profit expectations of mass production is generally very low. Secondly, if foreign trade is not handled properly during the first phase, imports may far exceed exports resulting in huge accumulation of foreign debt. This has actually happened in Brazil, Mexico and in a few other countries and finally the growth rate slowed down to a very insignificant level. On the contrary with proper handling of foreign trade and domestic production activities of Republic of Korea and many other East Asian countries have shown excellent results of high growth with equity. It may be pointed out here that in these countries government policies have played a leading role in directing the flow of resources through appropriate policy design and their implementations.

India's poverty can essentially be explained due to lack of productive capacity to make available all the necessary basic needs of Nutrition, Education, Health and Habitat for all. This failure is definitely not due to lack of resources

as much as due to faulty priorities adopted in our planning process.

It may be wrong to assume that planning has lost its significance in the liberalisation era. On the contrary, planning has to feel the vacuum created by liberalisation in the area of achieving speedy poverty alleviation. In the immediate future planning has to deal with top priority for speeding up poverty alleviation through appropriate policies and strategies.

In the light of the above, two alternative scenarios of income trends during the course of the next two decades after reform have been provided here. These data will help to demonstrate the importance of planning in the context of current reforms.

Alternative I is worked out under the assumption that the development of the economy including poverty alleviation will be left to market forces with very limited role of government investment. Under the circumstances, it is assumed that the per capita income will grow @ 3.5% per annum, during the decade 1995-2005, and, @ 4.5% per annum during the following decade, 2005-2015. The growth rates during the first decade is expected not to be any better than that during 1980s due to the existence of various limitations of the Indian economy in technology and, trade, and, lack of adequate social, political and bureaucratic support necessary for speedy growth of the economy. In the second decade of 2005-2015 the situation is expected to improve resulting in growth higher by 1%.

It is further assumed that income distribution under this Alternative I will worsen in the first decade, but improve during the second decade.

Alternative II, on the other hand, is worked out under the assumption that along with reform programmes which will be mostly confined to speedy and efficient industrial growth, concurrent government intervention and involvement will be in place to speed up poverty alleviation programmes. It is expected that a strong government support in poverty alleviation will improve the overall growth prospects of the entire economy. Per capita income will grow at a higher rate compared to Alternative I @ 4.5% per annum, during the decade 1995-2005, and @ 5.5% per annum during the following decade, 2005-2015.

In this Alternative II, income distribution is expected to remain unaffected during the first decade and improve during the second decade.

Table below provides the projected figures of alternative income estimates and its patterns of distribution

by income/expenditure classes for the base year 1995, projected figures for 2005 & 2015 for Alternative I with those for Alternative II shown in brackets.

| Income Class | NNP per Capita in Rs. at 1993-4 prices. | | |
|--------------|---|--------------------------|--------------------------|
| | 1995 | 2005 | 2015 |
| Lowest 20% | 3185.3 | 3966.1 (4946.7) | 7409.4 (9221.2) |
| 2nd Quintile | 4524.6 | 5624.5 (7026.5) | 10558.0 (13066.5) |
| 3rd Quintile | 5863.9 | 7433.3 (9106.4) | 13312.0 (15555.0) |
| 4th Quintile | 7709.9 | 10875.6 (11973.2) | 16889.4 (20452.0) |
| Top 20% | 14913.0 | 23159.5 (23159.5) | 31124.4 (37724.3) |
| Top 10% | 19618.6 | 31956.6 (30467.1) | 41915.9 (49627.7) |
| TOTAL | 7240.0 | 10212.7 (11243.5) | 15860.1 (19205.5) |

It may be observed that the strategy of Alternative II with close involvement of public investment in poverty alleviation concurrently with reforms in industry will benefit mostly lower income classes during the first decade while during the second decade all income classes will benefit more than Alternative I.

Since India's problems of poverty is in the nature of a Herculean task of clearing the Augean Stable, active government role becomes absolutely essential. Planning for speedy poverty alleviation along with reforms of the industrial sector will help the economy to achieve faster and sustained economic growth. This is what is urgently needed for the Indian economy. Without the supporting role of effective planning for poverty alleviation, Indian economy's growth rates are going to suffer. Thus, even to strengthen reform measures planning will continue to be important.

4. A Micro Level Planning for Poverty Alleviation :

We discuss here a micro level planning framework for poverty alleviation. Let us consider the strategy to ensure the availability of basic needs at an affordable price commensurate with income levels of the poor.

Let us take the specific case of providing food and nutrition to all. This will require enhancing the production of food grains, fruits and vegetable, edible oils, fish, meat, eggs etc. In each region, say, a group of villages (Panchayats, for example), a multipurpose production plant can be conceived. The mix of production of nutrition items will depend on the availability of local level resources. The plant should be able to employ about 200 people. The private corporate sector should get the first chance, failing which a

co-operative or public sector unit may come forward to invest in these units. Different regions may have different composition of ownership structure depending on availability of entrepreneurial talents as well as willingness to invest from the part of private investors. However, public sector will have to play the role of investor of the last resort.

A Regional Development Authority (RDA) will be constituted in each region for planning and monitoring of basic needs planning activities. The members will be drawn from subject specialists apart from administrators and peoples' representatives. The members will enjoy autonomy in decision making and implementation, but accountable to higher authorities at State/Central government levels for results.

Apart from planning of production of food and nutrition the other important activities of the RDAs will constitute construction of residential housing, sanitation, school and hospital buildings, local roads etc. These activities apart from food and nutrition production will generate rural employment and income, make available basic needs, develop local assets and help in improving the standard of living for all.

Additional resources necessary for these programmes may be raised by introducing a new type of tax, say, development tax on all sectors of the economy including agriculture from the richer people who have been fortunate enough to reap substantial benefits from past developments.

The machinery for collection of all relevant statistics for plan monitoring will have to be strengthened. The monitoring will cover the collection of following data:

1. Trend of percentage of persons and mean income by income/expenditure classes.
2. Trend of availability of basic needs and their prices;
3. Trend of investment in the production of basic needs;
4. Trend of supply gaps and Imports of basic needs;
5. Trend of physical and financial assets formation by income/expenditure classes.

4. Summary and Conclusions :

The objective of this paper is to review the progress of the work on the construction of plan models for poverty alleviation in general and for the Indian economy in particular. In this context a critical review is first provided regarding poverty alleviation strategies so far adopted for India and the need for improvements in them. For

this a package of fresh strategies have been proposed here. The most important strategy proposed is the basic needs approach to development as proposed by ILO (1976,1977), and the planning model for this as originally outlined by IDRC, Canada by Herrera Amilcao O et al (1976).

In section 2 a general review is presented on the various attempts made in India on the treatment of poverty in India. In this context, the Five Year Plan models by Planning Commission, Govt. of India (1973, 1981 & 1986), model by Sinha R et al (1979), those by Dhar, & Rao (1983a & 1983b), and by Dhar, Rao & Goel (1991a, 1991b & 1993) have been discussed.

The Planning Commission models (1973, 1981 & 1986) are multisectoral consistency models of the Indian economy. Consumption vector of this model is estimated from a separate sub-model. This consumption sub-model estimates vector of consumption taking into consideration the given target of reduction of income inequality as well as the level of poverty. The necessary changes in the composition of the target of sectoral output levels as a result of such changes in the final demand are thus known. As the results achieved so far indicate, Planning Commission approaches could not bring about any significant improvements in either poverty alleviation or reduction in the distribution of income.

Sinha R et al (1979) model is also a multisectoral model for India. In this model both the vector of consumption (column) and the vector of value-added (row) have been broken down into income groups. This made possible the study of changes in the distribution of income as a result of changes in the final demand vector. One of the important conclusions of this study is that it is not possible to improve the share of the income of the poor through any change in the composition of final demands and outputs without adopting direct methods of increasing the share of incomes of the poor.

The study by Dhar & Rao (1983a), titled 'EMPOV' model uses the strategy of top priority for the production of basic needs as the most important pre-condition for speedy poverty alleviation. It is a multi-sectoral optimising model. Unlike the multi-sectoral models of both Planning Commission (1973, 1981 & 1986) and Sinha R et al (1979), this optimising model can consider all relevant constraints on Capacity/output, consumption, trading, employment generation, availability of basic needs items etc. and, therefore, is more realistic. An empirical analysis of this model was conducted for the district economy of Bangalore, Karnataka State, India. One of the most important conclusions of this study is that it is feasible in respect of availability of material and financial resources to achieve full employment with availability of most of the basic needs within about a

decade. The study is, however, silent about political feasibility. However, things donot remain same over time. This model may be useful in future when there may be political compulsion to adopt drastic measures as suggested in the EMPOV model.

Dhar, Rao & Goel (1991a) have expanded the above EMPOV model with certain modifications and conducted an empirical analysis of the Indian economy. This study also came out with similar conclusions as that of EMPOV model as above that unemployment and poverty can be substantially redressed within the short span of ten years or so. The same authors (1993) have also modified this model to be able to study the problems of poverty using a multi-regional framework and empirically tested it for the data of five regional subdivisions of the Indian economy. This study specifically focuses on reducing inter-regional disparity together with reduction of poverty and unemployment. Here again, it is observed that it is possible to achieve a good measure of success in both poverty alleviation and reduction of unemployment within a decade.

Dhar, Rao & Goel (1991b) have developed a separate model titled 'EMPOV II' model to be able to study the changes necessary in income distribution and the relative price structure to be able to match the demand and supply of basic needs items when adequate supply is ensured as top priority as discussed in the above models. It is observed that moderate changes simultaneously in both income distribution and relative prices will match available supply of basic needs with demands.

The above discussions emphasizes the urgent need for adopting and implementing more effective strategies for achieving speedy poverty alleviation in India through a basic needs approach of development. This will require a good deal of planning at the regional levels.

However, there is a general feeling that under liberalisation planning has lost its significance. This may not be true. It is argued in section 3 that liberalisation alone may not solve the problems of poverty at the speed at which it has to be necessarily achieved in India. A combination of liberalisation for efficient industrialization and planning for speedy poverty alleviation will not only be necessary for speedy poverty alleviation but will also strengthen the liberalisation efforts. Two alternative scenarios of projections of income and its distribution have been provided for the next two decades, 1995-2005 & 2005-2015. Alternative I projections provide data on the scenario of income and its distribution in the absence of planning and those in Alternative II with planning. Following the assumptions of this approach, Alternative II results indicate better performance in both the growth rates of per capita income as well as its distribution compared to

those of Alternative I. The assumptions and the data provided in these projections, it is hoped, may raise interesting debates.

To conclude the discussions on planning for achieving speedy poverty alleviation in India, a framework of a micro-level planning and implementation design has been suggested in section 4.

The author has serious doubts whether liberalisation alone can solve the deep-rooted problems of poverty in India with a reasonable speed. Therefore, the above framework is suggested here with the genuine hope that the poor who could not see much improvements in their standard of living during the planning era between 1950-51 to 1990-91, must see significant improvements in the next two decades.

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