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MULTIDIMENTIONAL POVERTY ANALYSIS - A CASE STUDY OF TWO GRAM PANCHAYETS OF SOUTH 24 PARGANAS DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT

India's prime focus in recent past is on eradicating poverty since independence. Planners have been trying to identify the people Below the Poverty Line (BPL) and build up a poverty index. Recent methodology used by the Government of India is criticized from different angles. A new methodology proposed by Alkire and Foster provides more information on poverty. The present study is based on the methodology of Alkire and Foster on two Gram Panchayets of Sundarban area of West Bengal, India.

KEYWORDS: *poverty, deprivation, multidimensional, new methodology, BPL.*

1. INTRODUCTION:

India has been combating poverty since independence. India's post independence most vital objective was to eradicate poverty and improving the living of those who were deprived and suffered. This very objective is so important because it strengthens the social, political and economic base of the nation.
In the beginning, Indian poverty measures were uni-dimensional and based on income or expenditure. From 2002, India identified rural households as 'Below the Poverty Line' (BPL) according to a thirteen-item census questionnaire. The 2002 census process was subsequently accused of corruption and low data quality and coverage. The methodology was subject to criticisms because of the weighting and aggregation processes, and the content of the thirteen-item survey was challenged. To respond to the criticisms regarding data content in the BPL survey, this paper subsequently presents an illustrative index of multiple deprivations that employs ten variables, each of which represent policy goals in the 11th plan. The poverty rates are disaggregated by state and broken down by dimension. The paper demonstrates that an alternative measurement methodology is able to specify the composition of multidimensional poverty in any given state or group and to guide policy concretely and specifically.

1.1. Significance of the study:

i. The present study points out the loopholes of the methodology applied by the Government of India for counting BPL.
ii. The present study focuses on a new methodology propounded by Alkire and Foster and stresses on calculating dimension adjusted deprivation indexes.
iii. The present study is ordinal and tries to overcome all the criticism of the methodology applied by the Government of India.

1.2 Objectives:

i. To analyse the BPL of two Gram Panchayet of South 24 Parganas district of West Bengal, India.
ii. To interpret the BPL as per Alkire-Foster method.
iii. To reconcile the findings of Alkire-Foster method and that of Government of India's method of counting

BPL.

1.3 Review of literature:

i. Radhakrishna and Ray (2005) and Ravallion and Datt (2002): Under the first four plans, the government of India aimed to reduce income poverty by pursuing a high rate of economic growth measured solely in terms of the per capita gross domestic product. The rate of economic growth, however, was insufficient to cause a sharp fall in income poverty across all states and, consequently, for the first two and a half decades, the income poverty rate hovered between 38 per cent and 57 per cent without any particular trend. The official measure of poverty for that entire period was based on income.

ii. Foster and Sen (1997): The Planning Commission appointed a Task Force on Projections of Minimum Needs and Effective Consumption Demand that defined the rural poverty line as the per capita consumption expenditure level, based on a minimum calorie intake in rural and urban areas. Thus although poverty measurement remained in income space, the basis of poverty measurement evolved from the income-based approach to the basic-needs-based approach.

iii. The Planning Commission (1979): According to the recommendation of the task force, the minimum basic food intake requirement for the rural and the urban habitants was 2,400 calories and 2,100 calories, respectively. Based on these minimum calorie requirements, the minimum required subsistence income levels were determined for different regions. These minimum required income levels were used as regional poverty thresholds.

iv. Hirway I (2003): He proposed that targeting,is not a statistical exercise, but a major political activity, The households identified as BPL access multiple benefits so there is a mad rush in all Gram Panchayet to be enrolled as BPL households. The rich and powerful in a village frequently pressurizes the *sarpanch* and the *talati* to include their names in the BPL list. He also finds that of the total 1997 BPL list members in Gujrat, 11 to 18% are clearly local elites and 14% of the poor households are excluded from the BPL lists.

v. Jain S.K. (2004): He argues that the pavement dwellers, households displaced by riots and communal violence, manual scavengers, and community involved in caste based prostitution are systematically excluded from the BPL status. Moreover the poor households may not be interviewed or their interviews may be distorted or they may not be able to convince the local elites or politicians to include their names in the BPL list.

vi. Khera R. (2008): His village level studies in Rajasthan come with a finding that 44% of poor households did not have a BPL card, and 23% of those with a BPL card were non-poor. His report stresses that corruption crowds out the poor from the BPL card ownership.

vii. Mukherjee N. (2005): In some Gram Panchayet of West Bengal the [BPL] list had been manipulated to the extent of 50% with the inclusion of many non-poor households. Though door to door BPL survey was conducted the final outcomes in term of the BPL list shocked many genuine poor in terms of not finding their names in the list.

viii. Bérenger V. (2017): Their paper investigates the levels and evolution of poverty in Malawi, Mozambique, Tanzania, and Zimbabwe using the decomposability properties of poverty measures based on a counting approach. We compare poverty measures such as the Alkire and Foster index with alternative poverty indices that are sensitive to inequality. Poverty is estimated using Demographic and Health Surveys for different years for Malawi (2004, 2010, and 2015), for Mozambique (2003 and 2011), Tanzania (2005, 2010, and 2015) and for Zimbabwe (2005, 2010, and 2015). The findings show that one obtains insightful information when looking at the breadth and inequality components of multidimensional poverty. The results showed that the most important contribution to the decrease in poverty came from nutrition in Malawi, mortality in Mozambique, and education in Tanzania and Zimbabwe, in both rural and urban areas. The increase in poverty in urban areas in Zimbabwe was characterized by a higher level among the poor of deprivations associated with access to basic services.

2 METHODOLOGY:

2.1 The 2002 BPL methodology's criticism:

Hirway (2003), Jalan and Murgai (2007), Mukherjee (2005) and Sundaram (2003) criticized the 2002 BPL methodology from many point of view. However these criticisms can be broadly classified into 3 types, i.e. methodological drawbacks in defining and aggregation, quality of data and corruption, and issues regarding data content.

a. Methodological drawbacks in identification and aggregation:

i. The categorization of the raw data and their orderings are in dispute. Moreover the distance between each dimensions are not known and it is not judicious to assume the distance to be uniform. For example, the score of the household members enjoying one square meal per day throughout the year and the score of a household including a person with professional degree or a graduate are same. But we all know that a country like India where about 60% of the students drop out in the secondary education level, a household with a person having a graduate of professional degree is sure to enjoy more than one square meal per day throughout the year.

ii. It would be practically misleading to assume that the dimensions are perfect substitute. The total score of a household is obtained by summing the scores of that household in different dimensions and if it is less than the cutoff z_s then the household is BPL. This leads to conception that the loss of one dimension is completely offset by the gains of other dimensions, which is contrary to the 'poverty focus axiom' and 'deprivation focus axiom' (see Akire and Foster 2007).

iii. It is observed that all dimensions are equally weighted, which means all dimensions are equally important and have equal valuable contribution towards poverty. But he reasons are unknown.

iv. The policymakers are not informed about the relative deprivation of the households. That is, who among the BPL are extremely poor rather than marginally poor?

b. Corruption and the quality of data:

According to Hirway (2003), 'Targeting, is not a statistical exercise, but a major political activity'. 'The households identified as BPL access multiple benefits so there is a mad rush in all Gram Panchayet to be enrolled as BPL households. The rich and powerful in a village frequently pressurizes the *sarpanch* and the *talati* to include their names in the BPL list.

There are other significant researches that conclude that the poor households may not be interviewed or their interviews may be distorted or they may not be able to convince the local elites or politicians to include their names in the BPL list. Jain observes that "Chaura Singh was excluded from the BPL list because the enumerator has filled up the form without visiting Chaura's house". Moreover Jain argues that the pavement dwellers, households displaced by riots and communal violence, manual scavengers, and community involved in caste based prostitution are systematically excluded from the BPL status (Jain, 2004).

Khera (2008) in his report stresses that corruption crowds out the poor from the BPL card ownership. His village level studies in Rajasthan come with a finding that 44% of poor households did not have a BPL card, and 23% of those with a BPL card were non-poor.

Hirway (2003) finds that of the total 1997 BPL list members in Gujrat, 11 to 18% are clearly local elites and 14% of the poor households are excluded from the BPL lists.

The picture of West Bengal is better described by Mukherjee (2005) that, 'in some Gram Panchayet the [BPL] list had been manipulated to the extent of 50% with the inclusion of many non-poor households……..though door to door BPL survey was conducted the final outcomes in term of the BPL list shocked many genuine poor in terms of not finding their names in the list'.

c. Data content:

The BPL census mainly focuses on resources like land, clothing, food etc. but they don't focus on capabilities i.e. the things that households are able to do and be.

The response structure of the questionnaire is somehow absurd as regards to the point the female headed households are more deprived. If we accept it for granted then the households where people are unable to work due to illness, unemployment may response 'other' which is the least score of the 4 options.

The logic of ordering incase of migration is not transparent. Poor households are migrant but the more educated households also migrate. For example a nuclear Bengali family whose son is a high profile software engineer residing in Chennai would receive a score of 2 and a family of bonded laborers that has not migrated anywhere would receive a score of 3.

The final question of BPL is 'preference of assistance from the government'. In this question there is no proper justification as to why a family seeking assistance on housing would receive higher scores than a family seeking assistance for skill upgradation.

2.2 New methodology (Alkire and Foster, 2008):

i. Definitions:

Let, n be the no. of households and d ≥ 2 be the no. of dimensions (factors) under consideration. Let, $y = [y_{ij}]$ denote the nXd matrix of achievements, where the typical entry $y_{ij} \geq 0$ is the achievement of households i = 1,2,3,……n and in dimensions j = 1,2,3,….d. Each row vector y_i lists household i's achievements, while each column vector y_{*j} gives the distribution of dimension j's achievements across the set of households. It is assumed that d is fixed and given and n is allowed to range across all positive integers. This allows comparing poverty among populations of different sizes. Hence, the domain of matrices is given by, $Y = \{y \in R_+^{nd} : n \geq 1\}$, this is due to the assumption that any household's achievement can be nonnegative real no. This allows accommodating larger or smaller domain as per researcher's choice.

Let, $Z_j > 0$ denote the cut off below which any household is considered to be deprived in dimension j. This leads Z to be a row vector of dimension specific cut offs. Also note that for any vector or matrix v, the expression |v| denotes the sum of all its elements, and μ(v) represents the mean of v, which is |v| divided by the total no. of elements in v.

A methodology '*M* ' (Alkire and Foster 2008) for measuring multidimensional poverty is made up of an identification method and an aggregate method. The identification function (Bourguignon and Chakravarty 2003) $\Omega : R^d_+ X R^d_{++} \rightarrow \{0,1\}$, which maps from household i's achievement vector $y_i \in R^d_+$ and cut off vector $Z \in R^d_{++}$ to an indicator variable in such a way that $\Omega(y_i ; Z) = 1$ if household i is deprived and $\Omega(y_i ; Z) = 0$ if household i is not deprived.

Now, applying Ω to each household's achievement vector in y, results the set $Z \in \{1,2,….n\}$ of households who are deprived in y given Z. Next the aggregation step then takes Ω as given and associates with the matrix y and the cut off vector Z to an overall M(y ; Z) of multidimensional poverty. These results to a functional relationship $M: Y X R^d_{++} \rightarrow R$ which is the index or measure of multidimensional poverty.

The methodology will be relevant if we replace the term achievement by deprivation. For any given y, let, $g^0 = [g^0_{ij}]$ denote the 0-1 matrix of deprivations associated with y. The element g^0_{ij} is defined as $g^0_{ij} = 1$ when $y_{ij} < Z_j$ and $g^0_{ij} = 0$ for $y_{ij} \geq Z_j$. From the matrix g^0 we can construct a column vector C of deprivation count, and $C_i = |g^0_i|$, where g_i^0 is household i's deprivation vector. Thus C_i is no. of deprivation suffered by household i. Note that when the variables in y are ordinal g^0 and C are still well defined i.e.; g^0 and C are both identical for all monotonic transformations of y_{ij} and Z_j.

For any given y, let, g^1 be the matrix of normalized gaps. And g^1 is defined as $g^1 = \frac{(Zj - yij)}{Zj}$ for $y_{ij} < Z_j$ or $g^1_{ij} = 0$ otherwise. Thus, g^1_{ij} is the measure of the extent to which the household i is deprived in dimension j.

Similarly for $g^2_{ij} = \frac{(Zj - yij)2}{Zj}$ for $y_{ij} < Z_j$, or 0 otherwise. Here g^2_{ij} measures the vernarability of deprivation of i^{th} household in j^{th} dimension.

ii. Identifying the deprived:

the basic question that comes who are deprived? In earlier definition section we had tried to give dimension specific cut offs. But the dimension specific cut offs alone do not suffice to identify which are deprived. So we must look for additional criteria that will focus across dimensions and arrive at a complete specification of identification methods. Thus for this reasons the cut off 'k' is introduced which considers deprivation across dimensions. The across dimension cut off k = {1,2,…d}. For some potential households $\Omega(y ; Z)$, let, for unidimensional aggregator function 'u' such that, $\Omega_u(y_i ; Z) = 1$ for $u(y_i) < u(Z)$, or 0 otherwise. The next question is what will be the value of k? To get an answer lets go by two methods i.e.; the union method and the intersection method.

The union approach is the most commonly used identification criteria. In this approach a household i is said to be multidimensionally poor if there is at least one dimension in which the household is deprived. The union based deprivation methodology may not be helpful for distinguishing and targeting the most poor households, since a household is termed poor if it is deprived in any one dimension.

The other method commonly known as the intersection method, which identifies household i to be poor if it is deprived in all dimensions. This method successfully identifies a narrow slice of population which is deprived. Moreover it inevitably misses many households who are experiencing extensive but not universal deprivation.

Thus an alternative, is to use a cut off level for C_i that lies somewhere between two extremes of 1 and d. That is for k = 1,2,….d, let, Ω_k be the identification method defined by $\Omega_k(y_i ; Z) = 1$ for $C_i \geq k$, or 0 otherwise. That is to say, Ω_k identifies household i as deprived when the no. of deprived dimensions in which i is deprived is at least k, otherwise it is not deprived. As because Ω_k depends both on within dimension cut offs Z_j and across dimension cut offs k, so Ω_k is called the dual cut off method of identification.

iii. Measuring poverty:

This is a process of measuring multidimensional poverty M(y ; Z) using dual cut off identification approach Ω_k. To begin with is the percentage of households that are poor, i. e.; the head count ratio (H) = H (y ; Z) is defined as $H = \frac{q}{n}$,where q = q (y ; Z) is the no. of households in the set Z_k (no. of poor households using dual cut off approach) and n is the total no. of households. Note that H violates dimensional monotonicity. This means that if a household becomes deprived in a dimension in which that household had previously not been deprived, H remains unchanged. That is if a poor household i becomes newly deprived in an additional dimension, then overall deprivation doesn't change.

So to combat this issue, an average deprivation share (A) across the deprived ones is introduced, which is defined by, $A = \frac{|C(k)|}{qd}$, where C(k) is the censored vector of deprivation counts and d is dimensions into consideration. The C(k) follows a rule i.e.; if $C_i \geq k$, then $C_i(k) = C_i$ or otherwise 0.

The first step is to measure the dimension adjusted head count ratio, which is given by $M_0 = HA = \frac{q}{n} X \frac{|C(k)|}{qd} = \frac{|C(k)|}{nd}$. Again $M_0 = \mu(g^0(k))$

Dimension adjusted head count ratio is based on dichotomus data i.e.; whether deprived or not. So it doesn't give information on the depth of deprivation. To measure the sensitivity of the depth of deprivation lets go to the g^1 matrix of normalized gap. The censored version of g^1 is $g^1(k)$. Let the average deprivation gap (G) across all dimension in which the household is deprived is given by, $G = \frac{|g1(k)|}{|g0(k)|}$

Thus the dimension adjusted deprivation gap $M_1 = HAG = \mu(g^1(k)) = \frac{|g1(k)|}{nd}$

Now M_1 satisfies monotonicity. But a natural question that comes, is it not also true that the increase in a deprivation has the same impact no matter whether the person is very slightly deprived or acutely deprived in that dimension. The latter's impact should be larger. So to combat this issue, the dimension adjusted M_2 can be calculated. M_2 is given by,

M_2 = HAS = $\frac{|g2(k)|}{nd}$, where average severity S = $\frac{|g2(k)|}{|g0(k)|}$

Thus in general the dimension adjusted measures M_α (y; Z) is given by , $M_\alpha = \mu(g^\alpha(k)) = \frac{|g\alpha(k)|}{nd}$ for $\alpha \geq 0$.

2.3 Data:

2.3.1 Data collection:

The data is collected from two Gram Panchayets that is, Bapuji and Netaji of Kakdwip Sub-division of South 24 Parganas district (Sundarban region) of West Bengal, through purposive sampling. 500 household of two sample Gram Panchayet were randomly surveyed through proper questionnaire.

2.3.2. Data analysis:

The poverty is measured and analyzed through the New methodology given by Alkire and Foster for counting BPL.

3. RESULTS AND DISCUSSIONS:

The South 24 Parganas district is in the Gangetic Delta of the Sundarban area of the West Bengal, India. It has a total area of 9960 sq. km. The total population of the district as per 2011 census is 8153176 persons and the density of the population is 820 persons per sq. km. Of the total population the urban population counts as much as 1089730 persons and the rural population scores as many as 7063446 persons. At least 86.6% of the total population of the district lives in rural area. The literacy rate of the district is 78.57%. Kakdwip is a Sub-division of South 24 Parganas district, and the two Gram Panchayets Bapuji and Netaji selected for the present study are under Kakdwip Sub-division.

The economy of the district is mostly agrarian and fisheries oriented. In 2006 the Ministry of Panchayati Raj named South 24 Parganas district as one of the country's most backward districts out of a total of 640 districts in India. It is one of the 11 districts in West Bengal currently receiving funds from the Backward Region Grant Fund Programme (BRGF).

Thus it is quite evident from above that the district has a problem of unemployment (including seasonal unemployment) as the secondary sector i.e. industries had not grown much to absorb the labor forces available in the district. Moreover most people in this district rely on agriculture and pisiculture which are almost fathomed to absorb any surplus labor.

The questionnaire for the survey was designed based on the Capability Approach. First of all nine important Capabilities (to do and to be) were defined (which were considered as dimensions for calculation). The 2002 BPL household survey was not based on the Capability Approach rather it is based on income or expenditure.

The questionnaire is ordinal and based on 5-point Likert scale. The scores range from 0 to 4. The dimension specific cut-off (z) is obtained as per the following basis:

Question- 1: Land holding: Here the cut-off is less than < 1-2 hect. Of irrigated / < 2-4 hect. Of un- irrigated land and the score is 2.

Question- 2: Housing: Here the cut-off is Semi-pucca house and the score is 3.

Question- 3: Health measured by Body Mass Index (BMI): It is measured by the formula (weight in Kg.) / (height in square meters). Here the cut-off is > 16 Kg/m^2,< 18.5 Kg/m^2 and the score is 2.

Question- 4: Sanitation: Here the cut-off is Type – 1 i.e. Composting toilet or dry toilet or pit latrine (ventilated) or pit latrine (with slab) or pit latrine (without slab). The cut-off score of this dimension is 1.

Question- 5: Ownership of capital assets: The cut-off is any 3 items among the following items viz. : a b/w or colour television, an electric fan, a pressure cooker, a radio, a cell-phone, a mattress, a table, a thresher, a refrigerator, a motorbike. The cut-off score is 3.

Question- 6: Literacy status: The cut-off is Passed class X and the score is 2.

Question- 7: Household labour force: The cut-off is 'only adult female work' and the cut-off is 2.

Question- 8: Means of livelihood: Here the cut-off is 'Agriculturist and provide own labour at field', the cut-off score is 1.
Question- 9: Status of child's education: The cut-off is Going to school and not working and the score is 4.
Question- 10: Financial empowerment represented by having a bank account: The cut-off for this is having a bank account and the score is 4.
The study of the questionnaire showed the following results:

Table- 1.2: Details of ratios at different 'k' values of Bapuji Gram Panchayet:

	k=3	k=4	k=5	k=6	k=7
q	244	240	195	125	65
N	245	245	245	245	245
H	0.996	0.976	0.78	0.5	0.26
M0	0.555	0.544	0.472	0.332	0.19
M1	0.74	0.709	0.56	0.34	0.17
M2	0.63	0.601	0.47	0.28	0.134

Table- 1.3: Details of ratios at different 'k' values of Netaji Gram Panchayet:

	k=3	k=4	k=5	k=6	k=7
q	246	240	221	153	81
N	255	255	255	255	255
H	0.984	0.96	0.884	0.612	0.324
M0	0.58	0.57	0.54	0.41	0.234
M1	0.47	0.468	0.45	0.34	0.204
M2	0.414	0.411	0.4	0.31	0.19

Table- 1.4: Details of ratios at different 'k' values of both Bapuji and Netaji Gram Panchayet (Total Sample):

	k=3	k=4	k=5	k=6	k=7
q	498	480	416	278	146
N	500	500	500	500	500
H	0.99	0.96	0.832	0.556	0.292
M0	0.57	0.56	0.52	0.44	0.3
M1	0.61	0.59	0.51	0.39	0.25
M2	0.52	0.51	0.44	0.34	0.221

From Table 1.2, it is clear that in the Bapuji Gram Panchayet the sample size (N) is 245 and out of them the no. of household deprived (q) is 244, 240, 195, 125 and 65 in at least k=3, k=4, k=5, k=6 and k=7 dimensions respectively. The head count ratio (H) i.e. proportion of household deprived is 0.996, 0.976, 0.78, 0.5 and 0.26 at k=3, k=4, k=5, k=6 and k=7 respectively. Moreover, among the samples collected only 167 families have BPL cards.

The dimension adjusted Head count ratio (M_0) in Bapuji Gram Panchayet is 0.555, 0.544, 0.472, 0.332 and 0.19 for k=3, k=4, k=5, k=6 and k=7 respectively. This indicates that though the Head count ratio (H) is very high at k= 3,4,5,6, but the households are not so dimensionally poor. M_0 deals in dichotomous data (0 or 1) so it doesn't give enough information on the depth of deprivation. To combat this issue of measuring sensitivity of deprivation, Dimension adjusted deprivation gap (M_1) is calculated. The M_1 for k= 3,4,5,6,7 of the sample is 0.74, 0.709, 0.56, 0.34 and 0.17 respectively. Dimension adjusted deprivation gap cannot measure the severity of deprivation, that is which household is acutely deprived and which is marginally deprived. So dimension adjusted M_2 is calculated. The M_2 for the sample of Bapujiis 0.63, 0.601, 0.47, 0.28 and 0.134 for k= 3,4,5,6,7 respectively.

From Table 1.3, it is clear that the Netaji Gram Panchayet sample size (N) is 255 and out of them the no. of household deprived (q) is 246, 240, 221, 153 and 81 in at least k=3, k=4, k=5, k=6 and k=7 dimensions respectively. The head count ratio (H) i.e. proportion of household deprived is 0.984, 0.96, 0.884, 0.612 and 0.324 at k=3, k=4, k=5, k=6 and k=7 respectively. Moreover, among the samples collected only 197 families have BPL cards.

The M_0 values are 0.58, 0.57, 0.54, 0.41 and 0.234 at k=3, k=4, k=5, k=6 and k=7 respectively. The M_1 values are 0.47, 0.468, 0.45, 0.34 and 0.204 at k=3, k=4, k=5, k=6 and k=7 respectively. The M_2 values are 0.414, 0.411, 0.4, 0.31 and 0.19 at k=3, k=4, k=5, k=6 and k=7 respectively.

Table 1.4 shows the detail of the total sample i.e; in both Bapuji & Netaji Gram Panchayet, the sample size (N) is 500 and out of them the no. of household deprived (q) is 495, 480, 416, 278 and 146 in at least k=3, k=4, k=5, k=6 and k=7 dimensions respectively. The head count ratio (H) i.e. proportion of household deprived is 0.99, 0.96, 0.832, 0.556 and 0.292 at k=3, k=4, k=5, k=6 and k=7 respectively.

The M_0, M_1 and M_2 values for at k=3, k=4, k=5, k=6 and k=7 are 0.57, 0.56, 0.52, 0.44 and 0.3; 0.61, 0.59, 0.51, 0.39 and 0.25; and 0.52, 0.51, 0.44, 0.34 and 0.221 respectively.

Table 2.1: Decomposition (in %) of different dimensions (Bapuji Gram Panchayet):

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	TOTAL
k=3	17.5	16.7	1.2	3.5	16.4	17.1	0.3	8.9	8	10.4	100
k=4	17.3	16.7	1.2	3.5	16.3	17	0.3	9	7.9	10.8	100
k=5	16.3	16	1.4	4.1	15.6	16.3	0.3	10	8.4	11.6	100
k=6	14.8	14.6	1.8	4.9	14.6	15	0.5	11.8	9.4	12.6	100
k=7	13.6	13.8	2.5	6.4	13.8	13.8	0.8	11.9	10.6	12.8	100

Table 2.2: Decomposition (in %) of different dimensions (Netaji Gram Panchayet):

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	TOTAL
k=3	16.8	16	0.7	4.5	15.4	16.2	0.2	10.1	9.2	10.9	100
k=4	16.7	16.1	0.7	4.6	15.3	16.1	0.2	10.1	9.2	11	100
k=5	16.2	15.7	0.7	4.9	15.1	15.6	0.2	10.5	9.5	11.6	100
k=6	15	14.7	0.9	6.2	14.7	14.7	0.2	11.1	10.2	12.3	100
k=7	13.8	13.3	1.2	8	13.8	13.7	0.3	11.5	10.9	13.5	100

Table 2.3: Decomposition (in %) of different dimensions (both Bapuji & Netaji Gram Panchayet):

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	TOTAL
k=3	17.2	16.4	0.9	4	15.8	16.7	0.2	9.5	8.6	10.7	100
k=4	17.1	16.3	1	4.1	15.8	16.6	0.2	9.6	8.6	10.7	100
k=5	16.5	16	1	4.4	15.4	16.2	0.3	10.1	8.8	11.3	100
k=6	15.7	15.3	1.1	4.9	14.9	15.4	0.3	11	9.5	11.9	100
k=7	14.6	14.4	1.4	6.3	14.4	14.4	0.4	11.4	10.3	12.4	100

Table 2.1 to 2.3 shows decomposition of different dimensions at different levels of k for Bapuji, Netaji and both Bapuji & Netaji Gram Panchayets. Decomposition means at a given level of k the % contribution of dimensions in M_0, M_1 and M_2. The % contribution toward M_0, M_1 and M_2 for all the three cases are X_1=17%, X_2=16%, X_3=1%, X_4=4%, X_5=16%, X_6=17%, X_7=0%, X_8=9%, X_9=9%, X_{10}=11% at k=3. This means Access to land holding (X_1) & Education (X_6) contributes most (17%) towards poverty at k=3. Next to this is Access to housing (X_2) & Access to capital assets (X_5) with 16% each. Next to them is Financial Empowerment (X_{10}), Means of Livelihood (X_8) and Child Status (X_9) with 11%, 9% and 95 respectively. The least contributors are Sanitation (X_4), Nutrition (X_3), Livelihood-labor force (X_7) with 4%, 1% and 0% respectively.

4. CONCLUSION:

Out of 500 samples collected from 2 Gram Panchayet namely Bapuji and Netaji of Kakdwip Sub-division of South 24 Parganas district of West Bengal's Sundarban area (India) only 364 (167 from Bapuji& 197 from Netaji) household have BPL cards. But Alkire and Foster methodology proposes that at k=3 total deprivation count is 498, at k=4 it is 480, at k=5 it is 416, at k=6 it is 278 and at k=7 it is 146. If it is taken for granted that the households deprived in at least 5 dimensions (which is not rational) will be treated as BPL then also the count is 416 higher than the official count of 364.

Head count ratio is very much uni-dimensional, so it doesn't consider the dimensional adjustments. Thus it is more rational to use dimension adjusted head count ratio (M_0). The M_0 for the whole sample is 0.57, 0.56, 0.52, 0.44 and 0.3; 0.61 at k= 3,4,5,6,7. This indicates that at k=3, 57% of the households are dimensionally poor and at k=7 it is 30%.

The M_0 of Bapuji is 0.555, 0.544, 0.472, 0.332 and 0.19 for k=3, k=4, k=5, k=6 and k=7 respectively. And that of Netaji is 0.58, 0.57, 0.54, 0.41 and 0.234 at k=3, k=4, k=5, k=6 and k=7 respectively. Bapuji is more dimensionally poor than Netaji.

Deprivation normalized gap is measured by M_1 index. The M_1 for the total sample at different levels of k =3,4,5,6,7 are 0.61, 0.59, 0.51, 0.39 and 0.25 respectively. This means that at k=3, household's deprivation gap is 61% of the cut-off limit and at k=7 this is 25% of the cut-off z.

The normalized deprivation gap of Bapuji for k= 3,4,5,6,7 of the sample is 0.74, 0.709, 0.56, 0.34 and 0.17 respectively. And that of Netaji is 0.47, 0.468, 0.45, 0.34 and 0.204 at k=3, k=4, k=5, k=6 and k=7 respectively. This implies that the deprivation gap of Bapuji is much more than that of Netaji. .

To measure the severity of deprivation M_2 is calculated. The M_2 of the total sample at k= 3,4,5,6,7 are 0.52, 0.51, 0.44, 0.34, 0.221 respectively. This means that at k=3, 52% of household are severely deprived and at k=7 this deprivation rate is 22.1%.

The M_2 score of Bapuji is 0.63, 0.601, 0.47, 0.28 and 0.134 for k= 3,4,5,6,7 respectively. And that of Netaji is 0.414, 0.411, 0.4, 0.31 and 0.19 at k=3, k=4, k=5, k=6 and k=7 respectively. The deprivation severity is acute in Bapuji than in Netaji.

While analyzing the decomposition of different dimensions of the whole sample of 500 households it is found that, the % contribution toward M_0, M_1 and M_2 for all the three cases are X_1=17%, X_2=16%, X_3=1%, X_4=4%, X_5=16%, X_6=17%, X_7=0%, X_8=9%, X_9=9%, X_{10}=11%. This means Access to land holding (X_1) & Education (X_6) contributes most (17%) towards poverty at k=3. Next to this is Access to housing (X_2) & Access to capital assets (X_5) with 16% each. Next to them is Financial Empowerment (X_{10}), Means of Livelihood (X_8) and Child Status (X_9) with 11%, 9% and 95 respectively. The least contributors are Sanitation (X_4), Nutrition (X_3), Livelihood-labor force (X_7) with 4%, 1% and 0% respectively.

Thus this multidimensional approach of computing poverty given by Alkire and Foster caters several aspects of poverty. It is first of all a dual cut-off technique, one in the primary level 'z' and the other 'k'. It gives the planners an insight of different horizons of poverty. It shows the Head count ratio (H) to indelicate the total number of poor based on cut-off 'k', then it measures the Dimensional adjusted head count ratio (M_0), It also measures poverty gap trough M_1 and severity of poverty by M_2. Finally it shows the contribution of each dimension towards deprivation.

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Appendix-A

The 2002 BPL methodology:

The 2002 rural BPL census comprises thirteen questions for each household, covering topics such as food, housing, work, land ownership, assets, education, and so on. Depending upon the response category selected, the household is assigned a score (0–4) for each variable. A household's score is then summed to create an aggregate score Si where $0 \leq Si \leq 52$. A poverty cut-off z_s is fixed at the state level or at lower levels for the aggregate score. Households falling below that area's z_s are identified as BPL.

Like every other poverty measure, the 2002 BPL methodology involves two aspects: the identification of the poor and the aggregation of the data into a single poverty index. Let us define the

notation we will use in describing the 2002 BPL method. Let us assume that there are N households in the economy and the welfare of each household is measured using D dimensions. The achievements of the households in the entire society are summarized by an N×D dimensional matrix X. The set of all N× D dimensional matrices is denoted by **X**. The symbol '**N'** stands for the set of non-negative integers. The sum of entries in any given vector or matrix a is denoted by |a|, while μ(a) is used to represent the mean of a. The achievement of the nth household in the dth dimension is denoted by x_{nd} for all d = 1,…,D and n = 1,…,N.

The first stage of the BPL method identifies which households are multidimensionally poor. Let us designate the set of categories for the d^{th} dimension by $I_d \in N$ with id being the highest integer for all d. At first an NxD matrix H is constructed from matrix X, where h_{nd} is the nd^{th} element of H such that $h_{nd} \in I_d$ for all d and n. thus the n^{th} element in the d^{th} can take any value between 0 and i_d such that $0 \leq h_{nd} \leq i_d$. Each household is thus provided a score in each dimension based on their achievement in that particular dimension. The overall welfare score of the n^{th} household is denoted by $S_n = \sum_{d=1}^{D} hnd$. The minimum possible welfare score is 0and the maximum is $S^* = \sum_{d=1}^{D} id$. Therefore, $0 \leq S_n \leq S^*$ for all n. A household is identified as poor if $S_n < z$ (z= cut off) and non-poor otherwise. Moreover $S_n = 1$ if $S_n < z$ and $S_n = 0$ otherwise for all n. finally the BPL rate is: $P_{BPL} = \frac{(\sum_{n=1}^{N} Sn)}{N}$. The minimum possible overall welfare score is zero and the maximum possible overall welfare score is $S^* = 52$, i.e. $0 \leq Sn \leq 52$ for all n. Households falling below that area's poverty cut-off (these vary by state or district) are identified as 'BPL'

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