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Economic Condition of Eastern Region of India- An Statistical Evaluation

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ABSTRACT

The social and economic scenario of the country has changed considerably during the period 1951 to till date. The eastern states of India are burdened population with limited resources. A total of twenty six socio economic indicators comprising of various characteristics of education, agricultural & allied activities, urbanization, electrification, economic prosperity and modernization were examined for classifying the socio-economic status of the states in eastern region of India. The secondary data on these variables were collected from various sources. The variables were normalized to give zero mean and unit variance. The indices of various characteristics of the states as well as over all status of the states have been determined. It was observed that the states like Bihar, Uttar Pradesh and Jharkhand are poor in education, agricultural and allied activity development, Urbanization, electrification and modernization. However, West Bengal is at better position in comparison to the other states of the eastern region of India. The education and modernization of Assam is considerably good. The overall result indicated that the education and electrification as key factors for the socio economic condition of the states

Key words: Status, Education, Modernization, Eastern Region

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INTRODUCTION

Since 1947, an era of Independence, India has made a remarkable progress through the various Five-yearly plans starting from 1951. As a result, the social and economic scenario of the country has changed considerably. Agricultural production has risen. Numbers of industries have grown up. Literacy has increased. Similar is the situation of eastern region of India which comprises of eastern UP, Bihar, Jharkhand, West Bengal, Assam, Orissa, and Chhattisgarh. The eastern region is an agriculturally High Potential region but the crop productivity is low and a large proportion of the population continues to fall far short of minimum basic needs. With a view to quantify the extent of socio economic development and the rankings among the different states with respect to socio-economic status of eastern region of India, the present study is undertaken.

Socio-Economic Indicators

The status of the socio-economic condition of a family or village or block or district or state or even a country

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cannot be determined by a single variable but a suitable combination of several variable which have the cause and effect relationship and explains the variability on the socio-economic condition to a considerable extent. A number of indicators when analyzed individually do not provide an integrated and easily comprehensible picture of real situation. Hence, there is a need of building up of a composite index of socio-economic indicators by integrating the various factors of interest using a suitable statistical device. For the purpose the following socio economic indicators having positive direction of in development as mentioned in several literatures has been considered under different heads.

A. Education

1. Male literacy (2001 census)
2. Female literacy (2001 census)
3. Rural literacy (2004)
4. Urban literacy (2004)

B. Agriculture and allied activity development

5. Production of rice crop (000 tones 2006-07)
6. Average yield of rice (qt/ha 2006-07)
7. Live stocks in 000 (2003)
8. Poultry in 000 (2003)

9. Milk production (000 tones 2005-06)
10. Egg production (Crores 2005-06)
11. Percentage of main workers to the total population (2001 census)
- C. Urbanization
 12. Increase in Urban population (1991-2001)
 13. Number of factories (2004-05)
 14. Number of workers (2004-05)
 15. Total No. of Motor Vehicles Registered 2003-04 (P) (in Nos.)
 16. Per capita Income 2000-01 (in Rs.)
- D. Electrification
 17. Per capita consumption of electricity (KWH) 2004-05
 18. Villages Electrified (Percentage) 31.03.2006
- E. Economic prosperity
 19. Net Domestic Product 2000-01 (Rs. In Crores)
 20. No. of Bank Branches as on 31.3.2008 (All Scheduled Commercial Banks)
 21. Per capita Credit- Deposit Ratio March 2008 (%)
 22. % of Population above Poverty Line 2004-05
- F. Modernization
 23. No. of News papers and Periodicals 2005-06
 24. Total Home Viewers of T.V. Urban (in Million)
 25. Total Home Viewers of T.V. Rural (in Million)
 26. No. of Policemen per 100 Sq. km of area 2005

A total of 26 socio-economic indicators have been included in the analysis. These indicators may not be sufficient to depict the real situation but these are the major interacting components of socio-economic development of a state.

MATERIALS AND METHODS

To derive a composite index from a set of variables, a wide variety of multivariate statistical techniques are available in the literature. Actually, the choice of the most appropriate method depends upon the type of problem, nature of the data and the objective of the analysis. The composite index can be built up using simple techniques like ranking and indexing methods. But these techniques have many limitations which have been pointed out by [Kundu and Raza \(1981\)](#). The major limitation arises from assumptions made about the indicators and their weightage in aggregate index. Keeping in view the limitations of different methods in determining the socio-economic status of an area, the following statistical procedures are used in the

study as suggested by [Narain *et al.* \(2009\)](#). [Bharati *et al.* \(1999\)](#) found the superiority of all possible regression analysis over the usual regression analysis and stepwise regression analysis.

As the various socio-economic indicators are have their own unit of measurement and follow different population distributions with different mean and variances, these indicators are not quite suitable for the combined analysis. Hence, the variables are standardized in the normal form to give mean zero and variance one in the following manner. Let the data matrix takes the form as:

		Socio-economic indicators				
Status	X_{11}	X_{12}	X_{13}	X_{1n}	
	X_{21}	X_{22}	X_{23}	X_{2n}	
	X_{31}	X_{32}	X_{33}	X_{3n}	
	
	X_{m1}	X_{m2}	X_{m3}	X_{mn}	

Denoting the above data matrix by $[X_{ij}]$; where $i=1,2,3,\dots,m$ (number of states) and $j=1,2,3,\dots,n$ (number of socio-economic indicators).

For standardizing the data the data matrix $[X_{ij}]$ is transformed to another data matrix of standardized indicators $[Z_{ij}]$ as follows:

$$[Z_{ij}] = \frac{X_{ij} - \bar{X}_j}{S_j}$$

where \bar{X}_j and s_j are the mean and standard deviation of j^{th} indicator.

Choice of Best Value (Z_{0j})

Since all the indicators mentioned above have positive effect on socio-economic status of a state, the maximum value of Z_{0j} associated with the j^{th} indicator is taken for the further analysis.

Pattern of Development (C_i)

For calculating pattern of development for i^{th} state, the

computations are performed in following steps:

$$P_{ij} = (Z_{ij} - Z_{0j})^2$$

$$(CV)_j = \frac{S_j}{X_j} \times 100$$

$$C_i = \left[\sum_{j=1}^n \frac{P_{ij}}{(CV)_j} \right]^{1/2}$$

Composite index (D_i) of Socio-Economic Development of i^{th} State of Eastern Region of India

From the above computed value of C_i , the mean (\bar{C}_i) and standard deviation (σ_{C_i}) are obtained using the standard procedure. Finally, Composite index (D_i) is obtained as

$$D_i = \frac{\bar{C}_i}{\sigma_{C_i}}$$

The value of D_i ranges from 0 to 1. The smaller value of D_i indicates high level of socio-economic development.

For the purpose of status grading the composite indices has been classified in following five classes with corresponding ranks.

Sl. No.	Range of Composite Indices	Rank
1	$0.0 \leq D_i < 0.2$	Excellent
2	$0.2 \leq D_i < 0.4$	Very good
3	$0.4 \leq D_i < 0.6$	Good
4	$0.6 \leq D_i < 0.8$	Poor
5	$0.8 \leq D_i < 1.0$	Very poor

Table 1: Status and composite index for Education

Sl. No.	States	Male literacy (2001 census)	Female literacy (2001 census)	Rural literacy (2004)	Urban literacy (2004)	Composite Index (D_i)	Rank
1	Assam	71.3	54.6	81	94	0.17	Excellent
2	Bihar	59.7	33.1	47	79	0.71	Poor
3	Chhattisgarh	77.4	51.9	57	83	0.34	Very good
4	Jharkhand	67.3	38.9	51	84	0.50	Poor
5	Odisha	75.3	50.5	61	78	0.40	Good
6	Uttar Pradesh	68.8	42.2	56	70	0.63	Poor
7	West Bengal	77.0	59.6	68	88	0.18	Excellent
	Average	70.97	47.26	60.14	82.29		
	Correlation with (1- D_i)	0.77*	0.94**	0.86**	0.86**		

RESULTS AND DISCUSSION

The status of socio-economic conditions along with the composite indices and their ranks for all the seven states of eastern region of India have been depicted in tabular forms under different heads of developments.

Status of Education

The table 1 indicates the status and rank of education in eastern region of India. The high male literacy (more than 75%) is observed for the states Chhattisgarh (77.4%), West Bengal (77%) and Odisha (75.3%) while considerable female literacy (more than 50%) is observed in West Bengal (59.6%), Assam (54.6), Chhattisgarh (51.9%) and Odisha (50.5). The state Bihar indicated the lowest literacy rate for both the sex i.e. male (59.7%) and female (33.1%). Assam is high in both rural and urban literacy (81% & 94 % respectively), while Bihar is low in rural literacy (47%) and Uttar Pradesh is low in urban literacy (70). On the basis of composite index the educational status of the states Assam and West Bengal occupies the excellent position, Chhattisgarh Very good position, Odisha Good position and Bihar, Jharkhand as well as Uttar Pradesh Poor position. The correlation coefficients between various aspects of literacy and the additive inverse of composite index are significant in which the maximum correlation is for Female literacy followed by urban literacy. The stepwise regression analysis between additive inverse of composite index and various aspects of literacy also yielded the significant contribution of the two variables Female literacy (2001 census) and urban literacy (2004) as given below:

$$(1-D_i) = -1.066 + 0.016^{**} (\text{Female Literacy}) + 0.011^{**} (\text{Urban Literacy})$$

S.E. (0.113) (0.001) (0.002)

% Contribution 75.8 24.2

$R^2 = 0.99$

The % contribution of female literacy is the key to increase the educational level of the states.

Status of Agriculture and Allied Activity

The table 2 indicates the status and rank of Agriculture and allied activity in eastern region of India. The production and productivity of rice crop during 2006-07 was highest in West Bengal followed by Uttar Pradesh. The least productivity was recorded for Jharkhand. The number of live-stocks is highest in Uttar Pradesh followed by West Bengal while the milk production is highest in Uttar Pradesh followed by Bihar. during the year 2003. Number of poultry was highest in West Bengal followed by Assam while Egg production was highest in West Bengal followed by Odisha. Percentage of main workers to the total population was recorded as highest in Chhattisgarh and low in Bihar, Jharkhand and Uttar Pradesh. On the basis of composite index the Agriculture and allied activity none of the states of eastern region of India possesses the excellent position. West Bengal have very good and Chhattisgarh good position. Status of the rest of states has Poor position with respect to Agriculture and allied activity. The correlation coefficients between various aspects of Agriculture and allied activity and the additive inverse

of composite index are significant except for Number of livestock and Milk production. The stepwise regression analysis between additive inverse of composite index and various aspects of Agriculture and allied activity yielded the significant contribution of Egg production as given below:

$$\begin{aligned}(1-D_i) &= 0.214 + 0.01^{**} \text{ (Egg Production)} \\ \text{S.E.} & (0.053) \quad (0.0) \\ R^2 &= 0.74\end{aligned}$$

However, the variables Average yield of rice (qt/ha 2006-07), Percentage of main workers to the total population (2001 census) and Production of rice crop (000 tones 2006-07) showed good response on Agriculture and allied activity development as indicated by Table 3.

Status of Urbanization

The table 4 indicates the status and rank of Urbanization in eastern region of India. The urban population is increasing at faster rate in Assam (36% per decade) followed by Jharkhand (23.6% per decade) and Bihar (23.6% per decade). Factories are more in Uttar Pradesh (9582) followed by West Bengal (6105) and least in Chhattisgarh (1343). Similarly, workers are more in Uttar

Table 2: Status and composite index for Agriculture and allied activity development

Sl.No.	States	Production of rice crop (000 tones 2006-07)	Average yield of rice (qt/ha 2006-07)	Live stocks in 000 (2003)	Poultry in 000 (2003)	Milk production (000 tones 2005-06)	Egg production (Crores 2005-06)	Percentage of main workers to the total population (2001 census)	Composite Index (D_i)	Rank
1	Assam	2916	16.23	13829	21664	747	53.6	26.6	0.67	Poor
2	Bihar	4989	10.41	27162	13911	5060	100.1	25.4	0.70	Poor
3	Chhattisgarh	5041	13.46	13493	8181	839	88.8	36.5	0.55	Good
4	Jharkhand	2968	9.59	15826	14429	1335	69.7	24	0.79	Poor
5	Odisha	6825	15.41	23391	17611	1342	127.9	26.1	0.62	Poor
6	Uttar Pradesh	11124	18.8	58531	11718	17356	92.3	23.7	0.63	Poor
7	West Bengal	14746	25.52	41619	60656	3891	296.4	28.8	0.36	Very good
	Average	6944.14	15.63	27693	21167.14	4367.14	118.4	27.3		
	Correlation with $(1-D_i)$	0.800*	0.861*	0.370ns	0.764*	0.028ns	0.862*	0.800*		

Table 3: Response of the Excluded Variables for Agriculture and allied activity development

Excluded variables	Production of rice crop (000 tones 2006-07)	Average yield of rice (qt/ha 2006-07)	Live stocks in 000 (2003)	Poultry in 000 (2003)	Milk production (000 tones 2005-06)	Percentage of main workers to the total population (2001 census)
Beta value	0.262	0.480	0.002	-0.145	0.023	0.389

Pradesh (453007) followed by West Bengal (417996) and least in Bihar (51430). Total Number of motor vehicles registered (2003-04) is more in West Bengal (2547963) and least in Uttar Pradesh (515982). The per capita income is high in Chhattisgarh (Rs. 30750) and Least in Bihar (Rs. 5466). However, of the seven states of eastern region of India, only West Bengal is at the Good position as indicated by the coefficients of composite index. As indicated by the correlation coefficient the number of motor vehicles is the only indicator of urbanization.

$$\begin{aligned}(1-D_i) &= 0.182 + 1.36^{**} \text{ (No. of Motor Vehicles)} \\ \text{S.E.} & (0.072) \quad (0.0) \\ R^2 &= 0.57\end{aligned}$$

Status of Electrification

The table 5 indicates the status and rank of Electrification in eastern region of India. The Per capita consumption

of electricity (KWH) 2004-05 is highest in Chhattisgarh (535.2 KWH) followed by Jharkhand (402.1 KWH) and it is least in Bihar (44.6 KWH). More than 80% of villages are electrified in West Bengal and Chhattisgarh, but the states like Jharkhand, Bihar and Odisha could not reach up to the level of 60% as on 31.03.2006. On the basis of the above two indicators of electrification the state Chhattisgarh stands at excellent position and Uttar Pradesh and West Bengal are at the very Good position and Assam at Good position while Bihar, Jharkhand and Odisha are still at poor position with regard to electrification. The prime indicators of electrification are % villages electrified as indicated by significant correlation coefficient. However, the stepwise regression analysis between additive inverse of composite index and various aspects of electrification yielded the significant contribution of the two variables Villages Electrified (Percentage) and Per capita consumption of electricity with percent of contribution 69 and 31 respectively.

Table 4: Status and composite index for Urbanization

Sl.No.	States	Increase in Urban population (1991-2001)	Number of factories (2004-05)	Number of workers (2004-05)	Total Number of motor vehicles registered (2003-04)	Per capita income in Rs.(2000-01)	Composite Index (D_i)	Rank
1	Assam	36	1710	101265	726819	11357	0.68	Poor
2	Bihar	23.6	1674	51430	750703	5466	0.79	Poor
3	Chhattisgarh	5.2	1343	77910	1215745	30750	0.79	Poor
4	Jharkhand	23.6	1607	117466	1216958	17092	0.61	Poor
5	Odisha	31	1749	116706	1524982	8547	0.62	Poor
6	Uttar Pradesh	25	9582	453007	515982	9721	0.65	Poor
7	West Bengal	20.3	6105	417996	2547963	16072	0.43	Good
	Average	23.53	3395.71	190825.71	1214164.57	14143.57	0.65	
	Correlation with ($1-D_i$)	0.238	0.4456	0.6634	0.7552*	-0.105		

Table 5: Status and composite index for Electrification

Sl. No.	States	Per capita consumption of electricity (KWH) 2004-05	Villages Electrified (Percentage) as on 31.03.2006	Composite Index (D_i)	Rank
1	Assam	85.3	78.3	0.44	Good
2	Bihar	44.6	52.8	0.62	Poor
3	Chhattisgarh	535.2	83.3	0.04	Excellent
4	Jharkhand	402.1	30.4	0.68	Poor
5	Odisha	394.9	55.2	0.4	Good
6	Uttar Pradesh	393.5	68.3	0.26	Very Good
7	West Bengal	247.5	86.6	0.27	Very Good
	Average	300.44	64.99	0.39	
	Correlation with ($1-D_i$)	0.53ns	0.81*		

$$(1-D_i) = -0.184 + 0.009^{**} (\% \text{ Village Electrified}) + 0.011^{**} (\text{Per capita Electricity consumption})$$

S.E. (0.075) (0.001) (0.000)

% Contribution 69 31

$R^2 = 0.96$

followed by Odisha (56.57) and least in Bihar (29.7) 94.6 % of the total population are above poverty line in Jharkhand and the states Assam, Odisha and Uttar Pradesh lies around 80% where as Bihar Chhattisgarh and West Bengal are having people only around 60% above poverty line. None of the variables indicated significant association with the additive inverse of Composite index, therefore no relationship between the variables could be established.

Status of Economic prosperity

The table 6 indicates the status and rank of Economic prosperity in eastern region of India. The Net Domestic Product is highest in Uttar Pradesh (Rs.159048 crores) followed by West Bengal (Rs.128387 Crores) and it is least in Assam (Rs.30279 Crores). Similarly, Number of bank branches is highest in Uttar Pradesh (8983) followed by West Bengal (4847) and it is least in Chhattisgarh (1117). Per capita C:D ratio is more in West Bengal (61.43)

Status of Modernization

The table 7 depicted excellent position of modernization in UP followed by West Bengal (Very good), Assam and Bihar (Good position). All the components of modernization have significant association in the additive inverse of composite indices. The stepwise regression analysis revealed significant contribution of variable Total Home Viewers of T.V. Urban (in Million)

Table 6: Status and composite index for Economic prosperity

Sl. No.	States	Net Domestic Product 2000-01 (Rs. In Crores)	No. of Bank Branches as on 31.3.2008 (All Scheduled Commercial Banks)	Per capita Credit-Deposit Ratio March 2008 (%)	% of Population above Poverty Line 2004-05	Composite Index (D_i)	Rank
1	Assam	30279	1317	41.23	80.3	0.57	Good
2	Bihar	46056	3676	29.7	58.6	0.83	Very Poor
3	Chhattisgarh	64063	1117	52.28	59.1	0.67	Poor
4	Jharkhand	46056	1599	35.15	94.6	0.57	Good
5	Odisha	30795	2501	56.57	81.0	0.44	Good
6	Uttar Pradesh	159048	8983	44.92	81.1	0.34	Very good
7	West Bengal	128387	4847	61.43	60.4	0.55	Good
	Average	72097.71	3434.29	45.9	73.59		
	Correlation with ($1-D_i$)	0.4859ns	0.5134ns	0.4652ns	0.5822ns		

Table 7: Status and composite index for Modernization

Sl. No.	States	No. of News papers and Periodicals 2005-06	Total Home Viewers of T.V. Urban (in Million)	Total Home Viewers of T.V. Rural (in Million)	No. of Policemen per 100 Sq. km of area 2005	Composite Index (D_i)	Rank
1	Assam	499	5.83	5.55	66.4	0.47	Good
2	Bihar	1584	4.19	6.24	54.8	0.49	Good
3	Chhattisgarh	445	3.15	4.1	22.3	0.65	Poor
4	Jharkhand	227	2.89	1.76	36.1	0.62	Poor
5	Odisha	1118	3.98	5.47	24.9	0.62	Poor
6	Uttar Pradesh	9885	18.53	23.43	63.5	0.18	Excellent
7	West Bengal	4133	17.8	13.89	90.8	0.22	Very Good
	Average	2555.86	8.05	8.63	51.26		
	Correlation with ($1-D_i$)	0.8594*	0.9667**	0.914**	0.8592*		

on the additive inverse of composite indices with 94 percent variation.

$$(1-D_i) = 0.320 + 0.027 \text{ (Total Home viewers of TV Urban in millions)}$$

$$\text{S.E.} \quad (0.033) \quad (0.003)$$

$$R^2 = 0.94$$

On the basis of sector wise composite indices, the weighted composite indices have been obtained by using the variances as their weights. The weighted composite indices indicated very good position of West Bengal and Chhattisgarh followed by Assam and Odisha at good position. But the state Uttar Pradesh remained at very poor position followed by Bihar at Poor position Table 8.

Conclusion

In eastern region, the state Assam and West Bengal ranked excellent position in literacy whereas, Bihar, Uttar Pradesh and Jharkhand showed the poor position. The agricultural and allied activity development is satisfactory in West Bengal as well as Chhattisgarh and poor in rest of the states of eastern region. There is slight development in urbanization in West Bengal but poor development in rest of the states. The electrification is more in Chhattisgarh followed by West Bengal, Uttar Pradesh and poor in Bihar and Jharkhand. The economic prosperity is Very good in Uttar Pradesh and Very poor in Bihar. The modernization is more in Uttar Pradesh followed by West Bengal, Assam & Bihar and poor in rest of the states. The overall socio economic condition of West Bengal & Chhattisgarh is satisfactory and unsatisfactory for Bihar & Jharkhand states. The result indicated education and electrification as key factors for the socio economic condition of the states.

Table 8: Status and composite index for socio economic indicators (sector wise and overall)

Sl. No.	States	Edu- cation	Agriculture and allied activity development	Urban- ization	Electrifi- cation	Econom- ic pros- perity	Modern- ization	Weighted compos- ite Index (D_i)	Rank
1	Assam	0.17	0.67	0.68	0.44	0.57	0.47	0.424156	Good
2	Bihar	0.71	0.70	0.79	0.62	0.83	0.49	0.663644	Poor
3	Chhattisgarh	0.34	0.55	0.79	0.04	0.67	0.65	0.381846	Very Good
4	Jharkhand	0.50	0.79	0.61	0.68	0.57	0.62	0.6095	Poor
5	Odisha	0.40	0.62	0.62	0.4	0.44	0.62	0.464791	Good
6	Uttar Pradesh	0.63	0.63	0.65	0.26	0.34	0.18	0.375116	Very poor
7	West Bengal	0.18	0.36	0.43	0.27	0.55	0.22	0.298856	Very good
	Average	0.42	0.62	0.65	0.39	0.57	0.46		

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