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RESEARCH ARTICLE

Gender Disparity in Participation in Agriculture & Industry: An Empirical Study of Selected States in Selected Dimensions

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Abstract

In India, since long, women were considered as an oppressed section of the society and they were neglected for centuries. Gender Inequalities refers to the obvious or hidden disparities among individuals based on gender consideration. This problem in simple term is known as Gender Bias which means gender stratification or making difference between a girl and a boy i.e. a male or a female. The main area of the present study is the estimation of the prevailing gender disparity in agriculture and industry of selected states of India in selected dimensions. The study is based on secondary data. Participation of Men and Women in Agriculture and Industry is taken into consideration to estimate gender disparity in these areas. The factor analysis method is applied for the purpose. The result substantiates the fact that there is male-female disparity in participation in agricultural and industrial sectors. The male-female disparity in participation in agricultural and industrial activities is found to be highest in case of Andaman and Nicobar islands and it is lowest in case of Uttaranchal among the selected states of India.

Keywords: *Economic development, Gender disparity, Status of women in selected Areas, Women empowerment.*

Introduction

The world population stood at 4068.1 millions long back in 1975. As per population median-variant projections made later, the world population would stand at 7197.2 millions in 2015. Almost every time, women comprised near about half of the world population. Despite of this numerical parity of women vis-à-vis men, they are relegated to an inferior status in almost every steps of social, political and economic life. However, the picture of women participation in different types of economic activities has recently been changing in favour of women gradually over time. In India more and more women are becoming agricultural wage labourers because of growing landlessness. Between 30 and 40 percent of the agricultural labour force is composed of women. However, female labour force participation has been decelerating in the face of surplus labour. In Bangladesh, where women are still considered as secluded, they are increasingly seen in the fields, and poverty forces them to come forth for other hard work, such as road construction: these activities are in addition to their long-standing essential but largely invisible works behind compound walls in seed selection, processing, winnowing and threshing. In China, the female labour force in rural areas has greatly increased over the past 25 years, as women's participation in agriculture and in many non-farm activities has been strongly encouraged, both to increase production and to combat discriminatory practices and prejudices. In Latin America, women work more in agriculture than is commonly thought, even without counting such activities as processing done in the fields and services provided to field workers. Indian agriculture**,** often considered **a**s a male farming system, is in fact better characterized as a family farming system [1].

There is a large proportion of female labour in the plantation sector and industrial sector as well. Working as tea pluckers, as rubber tappers, or as casual workers on coconut plantations, women in Malaysia and Sri Lanka, for example, constitute more than half of the labour force; but they receive lower pay than man for the same work, face extra burdens because of inadequate child-care facilities and the long distances between home and work and often see others collecting their pay [1]. Rapid industrialization, while expanding employment opportunities, has not

fully benefited working women, since they often lose traditional sources of income without getting new jobs. This has happened in such newly industrialized countries as Brazil, India, Mexico and Nigeria. Various studies show that women are increasingly confined to home work and in marginal service jobs in the urban informal sector where employment is casual and irregular and where incomes are very low. It is also characteristics of most developing countries that mainly young unmarried women in the 20-25 age group, obtain employment in the formal sector [1]. Considering the importance of increased female participation in every walk of life, UNDP lend special endeavor for developing Gender Equivalence Sensitivity Index in addition to HDI. The gender related development index (GDI), introduced in Human Development Report,1995, measures achievements in the same dimensions as that in HDI using the same indicators as the HDI but captures inequalities in achievements between women and men. It is simply the HDI adjusted downward for a gender inequality. As per report HDR-2004, the countries with worse disparities between their GDI and HDI values are Saudi Arabia, Oman, Pakistan, Yamen and India, indicating a need for greater attention to gender equality. Sweden, Denmark, Australia, Latvia and Bulgaria have the closest correspondence between HDI and GDI.As per HDR -2004 prepared by UNDP, India's HDI rank is 127 and its GDI rank is 103 out of 177 countries.

The Analytical Framework

Gender disparity can be studied in different dimensions such as gender disparity in social sector, in cultural sector, in economic sector, in political sector, in education, health etc. Although all types of gender disparity are most unwelcome development, gender disparity in economic sector is the most unwanted but at the same time unavoidable event. This is because; gender disparity in economic sector weakens the process of women's empowerment leading to further deterioration of the economic status of the women. It is unwanted from the perspective of the health of the economy of a country as a whole as women constitute near about half of the populace. Leaving them behind a country simply cannot march forward.

Gender disparity in economic sector may crop up and perpetuate in the different arenas of the economy such as Agriculture, Industry, Plantation, Education, Health, Services, entrepreneurship etc. These can be referred to as gender disparity in the different dimensions of the economy. The problem of gender disparity can be studied by taking either all the dimensions together or in a piecemeal manner.

The second important aspect of the problem is to quantify the term disparity to facilitate comparison and also to understand the gravity of the situation. Any dimension to look into for understanding the problem of gender disparity, may comprise of different indicators. For example, to understand gender disparity in Agriculture, one may have to consider variables such as 'number of male and female agricultural labourers, number of male and female farmers', ' number of male and female agricultural wage earners' etc. In comparative studies, such variables corresponding to different units of study may assume different values with out a consistent pattern. Obviously, such inconsistent and unsystematic but actual values of the variables will make comparative analysis a difficult job for the researchers. A scientific approach to tackle problem like this is to construct a representative index by assigning appropriate weightage to the variables .Large number of studies in different fields have formulated and constructed indices for analyzing 'disparity' [2,3]. Different methods are applied by different authors for constructing the composite index. The popular methods are (i) The Equal Weightage Index method (ii) Deprivation method (iii) Principal Component method (iv) Method of Composite Index of Development (v) The Range Equalization method etc. Among these, the widely applied methods are Factor Analysis, Principal component method and the Range Equalization method.

Factor analysis attempts to estimate the value of the coefficients of regression where the variables are regressed upon the factors [4]. In this method, a set of 'n' variables are grouped into 'p' number of groups called 'Factors' which are less in number than the set of original variables. The variables within a group (Factor) are of the same nature or are complementary with respect to the phenomenon under study but between two groups 'Factor' variables are independent. Thus factors Fi and Fj are orthogonal.

The vector of all original variables can be written as,

$X = LF + U$

Where $X' = [X_{1'}\ X_{2'}\ \ldots\ldots\ldots\ldots X_{n'}]$
F is vector of 'Factors' derived
$F' = [F_{1'}\ F_{2'}\ldots\ldots\ldots\ldots\ldots F_{n'}]$
U is vector of error terms
$U' = [E_{1'}\ E_{2'}\ldots\ldots\ldots\ldots E_{n'}]$

L is matrix of Factor Loading (Loading Coefficient Matrix)

$$L=\begin{pmatrix} a_{11}\ a_{12}\ a_{13}\ldots a_{1p} \\ a_{21}\ a_{22}\ a_{23}\ldots a_{2p} \\ a_{n1}\ a_{n2}\ a_{n3}\ \ldots a_{np} \end{pmatrix}$$

The coefficient (Factor Loading) belongs to the ith variable and jth Factor which is similar to simple correlation coefficient and shows the extent to which variable X_i is related to F_j factor. A salient loading is one which is sufficiently high to assume that a relationship exist between the variable and the factor. In addition, it usually means that relationship is high enough so that the variable can aid in interpreting the factor and vice versa [5].

The sum of square of factor loadings of X_i original variables under the derived p factors is called the communality for X_i variable and is calculated as under:

$(a_{i1})^2 + (a_{i2})^2 + (a_{i3})^2 + \ldots\ldots\ldots\ldots\ldots (a_{ip})^2 = (C_i)^2$

Communality in Factor Analysis is some thing like R^2 in the regression analysis and it shows the extent to which the derived factors explain the ith variable. Derived Communality value showed generally should be larger (more than 70 percent) so that there is surety that each variable has been explained well.

In Range Equalization method, first, the negative indicators are made positive. Secondly, the indicators are made scale free. Lastly, the scale-free indicators are added up within each category for each study unit. The aggregate value divided by the number of categories represents the index.
Once the composite index is calculated, the disparity is worked out by applying simple statistical methods such as Range, Standard Deviation, Co-efficient of Variation etc.

Methodology

In order to examine gender disparity in the present study, participation of Men and Women in Agriculture and Industry is taken into consideration. As relevant data pertaining to all the states of India are not available, only those states corresponding to which data are available, are taken for the study. The variables identified for representing Male, Female participation in agriculture and industry are as follows:

- State-wise No. of Agricultural Labourers (Male, Female as % to total ,2001) : X_1
- State-wise average Daily Employment in Plantation(Male, Female as % to total, 2001) : X_2
- State-wise Average Daily Employment in Agriculture (Male, Female as % to total,2002) : X_3.
- State-wise Workforce Participation Rates in Industry, Male, Female in percentage,Rural,2004-05) : X_4.
- State-wise Workforce Participation Rates in Industry, Male, Female in percentage,Urban,2004-05) : X_5
- State-wise Labour force Participation Rates in Industry, Male, Female in Percentage, Rural,2000-01 : X_6.
- State-wise Labour force Participation Rates in Industry, Male, Female in Percentage, Urban, 2000-01 : X_7.

The gathered data is presented in simple statistical forms such as Mean, S.D etc. Data is also analyzed by applying Factor Analysis. Finally, the interstate disparity is measured by applying Standard Deviation (SD) and disparity between male and female is gauged in terms of difference in activity level on the basis of the values of the index of composite participation rate.

The main objective of the study is to find out the level of Male- Female participation in Agriculture and Industry combined. For this purpose, the level of participation of Male and female in Agriculture and Industry combined is also estimated separately. The research question that follows from the objectives of the study is "Does there exist a noticeable difference between male and female participation levels in agricultural and industrial activities taken together?"

Data Analysis, Results and Findings

In this section, the data collected from different sources are put to analysis. The factor analysis method is applied for the purpose. The variables taken for the purpose ie X_1 to X_7 are defined in the methodology section of the study.

The table communalities explain how much variance in X_i is explained by the extracted factors. For example, against variable X_7 the

extraction value is 0.95. Therefore 95% of variance in X_7 is explained by the extracted factor.

Table 1: Communalities

Variables	Initial	Extraction
X_1	1	0.759
X_2	1	0.765
X_3	1	0.600
X_4	1	0.843
X_5	1	0.557
X_6	1	0.902
X_7	1	0.950

The eigen values show that there are seven factors carrying initial eigen values from 3.347 to 0.002. The second part of the total variance explained table, titled Extraction Sum of Square Loading, gives information for factors with eigen values more than one. In this case it is observed that two factors have eigen values more than one. Hence the component matrix is constructed with two factors. The component matrix (for two factors) is shown in table 2.

Table 2: Component matrix (For two factors)

Variables	Factor 1	Factor 2	Communality	Weight	% Weight
X_1	0.269	0.828	0.757945	0.240029	10.5678
X_2	0.596	0.641	0.766097	0.185819	8.1811
X_3	0.123	0.772	0.595984	0.223795	9.85308
X_4	0.904	0.214	0.817216	0.432193	19.0283
X_5	0.682	0.303	0.556933	0.326057	14.3554
X_6	0.877	0.366	0.903085	0.419285	18.4599
X_7	0.929	0.295	0.953006	0.444145	19.5545
Variable explained	47.809	28.989			
Cumulative Variance	47.809	76.798		Total= 2.27132	Total=100

Table 3: Composite Index of Activities for Males (Agriculture and Industry Combined)

States	Composite Index
Assam	10.7858
Himachal Pradesh	10.7664
Karnataka	11.1074
Kerala	10.7835
Tamil Nadu	11.3132
Tripura	10.1919
Uttaranchal	9.4818
West Bengal	11.2078
Andaman & Nicobar Islands	11.6630
Mean	**10.8112**
Standard Deviation	**0.6437**
Highest Value	**11.6630**
Min Most Value	**9.4818**

The weight of different variables has been identified with the help of factor analysis method. With these weights and the standardized values of the variables, the composite index of activities for males in agriculture and industry for different states taken under consideration has been calculated. This is shown in table 3.

From table 3, it is observed that Andaman & Nicobar Islands has the highest composite Index value which indicates that the activities of males in agriculture and industrial sectors are at a relative maximum in terms of their participation. The lowest value is observed in case of Uttaranchal. However low value of standard deviation implies that there is low inter-state disparity in participation rates of males in agricultural and industrial sectors. The composite values for most of the states under consideration is very near to the mean value for all the states taken together indicating that participation rate is more or less same in the states for the males.

Just like the preceding section, the participation rate of female is worked out with the help of similar set of variables taken for males. To highlight gender disparity, the picture of female participation in agricultural and industrial sectors, taken together, is presented below with the help of the following tables.

Table 4: Communalities

Variables	Initial	Extraction
X_1	1	0.490
X_2	1	0.914
X_3	1	0.885
X_4	1	0.788
X_5	1	0.886
X_6	1	0.938
X_7	1	0.929

From Table 4, it is observed that 94 percent of the variance in variable X_6 is explained by the extracted factor. Here also, only two factors have shown eigen values more than 1. As such component matrix in Table 5 is shown with two factors. The weights attached to the factors are calculated and shown in column 5 and as

Table 5: Component matrix (for two factors)

Variables	Factor 1	Factor 2	Communality	Weight	% Weight
X_1	0.664	0.220	0.489296	0.32644	13.00
X_2	0.479	0.827	0.91337	0.28230	11.25
X_3	0.195	0.920	0.884425	0.314042	12.51
X_4	0.875	0.148	0.787529	0.430176	17.14
X_5	0.901	0.272	0.885785	0.44296	17.65
X_6	0.947	0.202	0.937613	0.46557	18.55
X_7	0.506	0.821	0.930077	0.24876	9.91
Variables explained	49.163	34.135			
Cumulative variance	49.163	83.298		Total=2.51025	Total=100

percentage weight in column 6. The maximum weight is attached to variable X_6 ie 18.55 percent. The lowest weight is attached to the variable X_7. With these weights the composite index of activities is calculated and is shown state-wise in Table 6.

Table 6: Composite index of activities for females (agriculture and industry combined)

States	Composite Index
Assam	2.663568
Himachal Pradesh	4.131832
Karnataka	3.912991
Kerala	3.359191
Tamil Nadu	4.039188
Tripura	2.325602
Uttaranchal	3.064785
West Bengal	2.730453
Andaman & Nicobar islands	2.424964
Mean	**3.183619**
Standard Deviation	**0.706718**
Highest value	**4.131832**
Min Most Value	**2.325602**

Conclusion

In the present study, seven variables are taken to understand the extent and the difference of male and female participation level in agriculture and industry. The variables are number of agricultural male and female labourers as percentage to total, average daily employment of male and female in Plantation as percentage to total, average daily employment of adult male and female as percentage to total, work force participation rates of male and female in industry in rural as percentage to total, work force participation rates of male and female in industry in urban areas as percentage to total, labour force participation rate of male and female in rural areas of industries as percentage to total and labour force participation rate of male and female in industries in urban areas as percentage to total.

The results show that in case of male, 95 percent of variance in state-wise labour force participation rate in industries of urban areas is explained by the extracted factors. In case of females, near about 94 percent of the variance in the same of rural areas is explained by the extracted factors. In case of male, the maximum weight is found to be attached to the variable X_7 whereas in case of famale, the maximum weight is with the variable X_6.

The composite index values present a very interesting picture. In case of male, the index values of the states indicate high level of male participation in agricultural and industrial works in comparison to females. The participation index is highest in the state of Andaman and Nicober in case of males. For females, the participation index is highest in case of the state of Himachal Pradesh. However, degree of inter-state disparity for both male and female is low and it is lower in case of males. The mean participation index value of the states is high at 10.81 in case of male but it is very low at 3.18 in case of females. This shows the male-female disparity in participation in agricultural and industrial sectors. The composite

index values show this disparity very clearly state-wise. The state-wise disparity is shown in the following Table 7

Table 7: State-wise male-female difference in activities

State	Male-female difference
Assam	8.122242
Himachal Pradesh	6.634578
Karnataka	7.194389
Kerala	7.424309
Tamil Nadu	7.273963
Tripura	7.866308
Uttaranchal	6.416865
West Bengal	8.477337
Andaman & Nicobar islands	9.238036

The male-female disparity in participation in agricultural and industrial activities is found to be highest in case of Andaman and Nicobar islands and it is lowest in case of Uttaranchal [5].

Recommendations

High gender disparity results in low level of women empowerment which is basic cause the overall underdevelopment of women folk. As such strong policy measures need to be undertaken for removing gender disparity. The state-wise picture of gender disparity in participation leads to the suspicion that women are under represented in many states of the country. The government should undertake special training and awareness programmes for women for enabling them to join the agriculture and industry in a beneficial manner. This will help the regions to grow faster. The large scale participation of women in important sectors like industry and agriculture will help them to be self sufficient. Identification of states where women are under represented and formulation and adoption of appropriate policies for the women will remove male female disparity and in the long run there will be more equitable growth in the economy.

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