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**RESEARCH ARTICLE**

# BODY MASS INDEX OF FARM WOMEN IN RURAL INDIA: AN ANALYSIS THROUGH SCORE OF SOCIO-ECONOMIC AND AGRO-ECOLOGICAL CORRELATES

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**ABSTRACT**

Body Mass Index (BMI) is a commonly used anthropometric measurement to estimate the level of nutritional indices (underweight/overweight) of adolescents and adults. Factors affecting BMI is essential for developing intervention programs. The present study was thus undertaken with the objective to assess the agro-socio-economic factors related to body mass index (BMI) content of farm women, of West Bengal, India. The study was confined to the women of age group of 19-60 years. A total of 211 women were selected randomly. BMI (weight/height$^2$, kg/m$^2$) was measured by taking height & weight of the participants. This present paper examines the socio-economic and agro-ecological predictors to a score of 26 exogenous variables which are correlated with the body mass index (BMI) of farm women. Multivariate analysis was carried out to understand the complex nature of variable interaction. It shows Irrigation index($X_9$) & Animal entrepreneurial index($X_{14}$) have a great contribution to the body mass index (BMI) of farm women.



## INTRODUCTION

Health is an asset to man and to his community and has come to be regarded as a prerequisite to socio-economic development. Nutritional status has a causal effect on work capacity, productivity and, in all likelihood, economic and social prosperity in low income settings. Rural women who are important segment of nation have a great active role in the development of agriculture, animal husbandry, village cottage industries and several other facets of rural life besides the home and family is well established and it is a known fact. It would be not proper to think of economic development in rural areas, without active involvement and participation of the women folk in the development programmes. Agricultural production viz. yield of crops grown, number of crops grown and others factors related farm have a delirictus impact on the farm-life and have a great effect on farm women's health status. The nutritional and health status of women is of great concern in the contemporary world, because the multiple roles played by women give rise to serious health and nutritional problems (McGuire and Popkin 1988; Jacobson 1993) Body mass index (BMI), a statistical measure of a person's weight scaled according to height, is used to classify people into the categories of obese (BMI $\geq$ 30), overweight (25 $\geq$ BMI < 30), normal range (18.5 $\geq$ BMI < 25) and underweight (BMI < 18.5) (World Health Organization, 2000). It indicates nutritional status of a person. The relationship between body mass index and socioeconomic status (SES) has been studied in both developed and developing nations, including in India.(Srinivasan and Tara 1989; The world Bank 1996; Raskey *et al.,* 1996 Hussain *et al.,* 2008; Subramanian *et al.,* 2011) This present study was conducted to identify the agro economic and socioeconomic factors which have a notable impact in nutrition as well as BMI.

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## MATERIALS AND METHODS

The present study was conducted in four villages of West Bengal. Selection of the locale was finalized based on the following factors- i) area with preponderance of the problem and character, ii) accessibility, iii) even distribution of respondents, iv) representative to the region. The villages (Bhawanipore, Satyapole, Bramhopur, Panchkahonia) selected come under Haringhata I block of Nadia District. The selection of the district, blocks and Gram Panchayet areas have followed purposive selection. The study was confined to the women of age group 19-60 years only. Randomly 211 subjects willing to participate in the study were chosen. A questionnaire schedule

was prepared to collect various information regarding subjects. Schedule was pretested on a non sample population having similar socio-economic background. General information related agro-socioeconomic factors of subjects were collected using the same schedule. To assess the Body Mass Index (BMI) anthropometric measurements of women recorded included weight and height. The method as suggested by Gibson (1990) was followed for this. Measurements were taken in triplicate and average values were recorded. A weighing machine made with a maximum capacity of 120 and least count of 0.1 kg was used to record the body weight and a vertical anthropometric rod with the least count of 1.0 mm was used for measuring height. The Body mass Index (BMI) was calculated by computing (weight/height$^2$, kg/m$^2$).

**Data analysis**

The statistical analysis was done on computer in MS-Excel and SPSS with complier. The data was analyzed for mean, Standard deviation, regression co-efficient, path analysis to estimate relations and interactions. The independent variables are $X_1$-Age, $X_2$-Education,$X_3$-Family statement, $X_4$-Family education, $X_5$- Homestead land (bigha), $X_6$- Cultivated land (bigha), $X_7$- Land under irrigation d (bigha),$X_8$- Cropping intensity, $X_9$- Irrigation index, $X_{10}$- Expenditure index (Education &Others), $X_{11}$- Expenditure index (Food & Health), $X_{12}$- Owner agricultural implements, $X_{13}$- Technology socialization status, $X_{14}$- Animal entrepreneurial index, $X_{15}$- Animal production consumption index, $X_{16}$- Animal production sale index, $X_{17}$- Crop diversification index, $X_{18}$- Media-social interaction index ,$X_{19}$- Market interaction, $X_{20}$- Entrepreneurial interaction, $X_{21}$- Capacity building index, $X_{22}$- Credit rotation index, $X_{23}$- Distance of road, $X_{24}$- Status of sanitation index, $X_{25}$- Distance matrix, $X_{26}$- Health index and the dependent variables are-$Y_1$- Body Mass Index (BMI)

## RESULTS AND DISCUSSION

**Table 1. Correlation coefficient of Body Mass Index ($Y_1$) with 26 independent variables**

| | N=211 |
|---|---|
| Age($X_1$) | 0.2125** |
| Education( $X_2$) | 0.0263 |
| Family statement( $X_3$) | 0.0347 |
| Family education( $X_4$) | 0.0976 |
| Homestead land( $X_5$) | 0.0185 |
| Cultivated land( $X_6$) | 0.1141 |
| Land under irrigation($X_7$) | 0.1183 |
| Cropping intensity($X_8$) | -0.0052 |
| Irrigation index($X_9$) | -0.0053 |
| Expenditure index (Education &Others)($X_{10}$) | -0.1116 |
| Expenditure index (Food & Health)($X_{11}$) | -0.1218 |
| Owner agricultural implements($X_{12}$) | -0.1138 |
| Technology socialization status($X_{13}$) | 0.1482* |
| Animal entrepreneurial index($X_{14}$) | -0.1779* |
| Animal production consumption index($X_{15}$) | -0.1204 |
| Animal production sale index($X_{16}$) | -0.1456* |
| Crop diversification index($X_{17}$) | 0.1072 |
| Media-social interaction index($X_{18}$) | 0.1972** |
| Market interaction($X_{19}$) | -0.1273 |
| Entrepreneurial interaction($X_{20}$) | -0.0998 |
| Capacity building index($X_{21}$) | -0.1163 |
| Credit rotation index($X_{22}$) | 0.0532 |
| Distance of road($X_{23}$) | -0.1280 |
| Status of sanitation index($X_{24}$) | 0.0327 |
| Distance matrix($X_{25}$) | -0.0519 |
| Health index($X_{26}$) | -0.0662 |
| *significant at 0.05 level | |
| **significant at 0.01 level | |

**Model I- Correlation coefficient of Haemoglobin(%) ($Y_1$) with 26 independent variables**

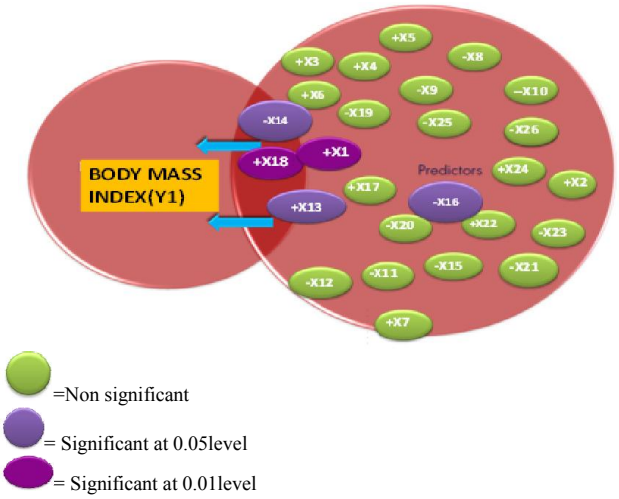



**Table 1. Presents the coefficient of correlation between Body Mass Index ($Y_1$) & 26 independent variables of total 4 villages**

## RESULTS

It has been found that the variables Age($X_1$), Technology socialization status($X_{13}$), Animal entrepreneurial index($X_{14}$), Animal production sale index($X_{16}$), Media-social interaction index($X_{18}$) are significantly correlated with the dependent variable Body Mass Index($Y_1$).

**Revelation**

Body Mass Index is the physio-morphological reflexion of the age($X_1$) or, age can be estimated through Body mass Index as well. Technology socialization status ($X_{13}$) has got a positive correlation to denote that the respondents who are incompliant with technology adoption process, they have got a better Body mass Index. Animal entrepreneurial index ($X_{14}$) and Animal production sale index ($X_{16}$) have created negative bearing on Body Mass Index that need to be interpreted through path analysis. It has been found that the respondents who are more exposed to Media-social interaction index ($X_{18}$), they are also characterized by Body Mass Index.

## RESULTS

Table 2 presents the path analysis of consequent variable, Body Mass Index ($Y_1$) versus 26 exogenous variables of pooled village by decomposing the total effect 'r' into direct, indirect effect and residual effect. The table revealed that the exogenous variable, Irrigation index($X_9$) has exerted highest total direct effect and the other exogenous variable Animal entrepreneurial index($X_{14}$) has exerted highest total indirect effect on the consequent variable, Body Mass Index ($Y_1$). The table also revealed that the exogenous variable, Irrigation index($X_9$) also has routed the highest individual dominating effect as many as 16 times to define the tremendous impact on

other exogenous variable to ultimately characterizing the performance of consequent variable, Body Mass Index ($Y_1$).

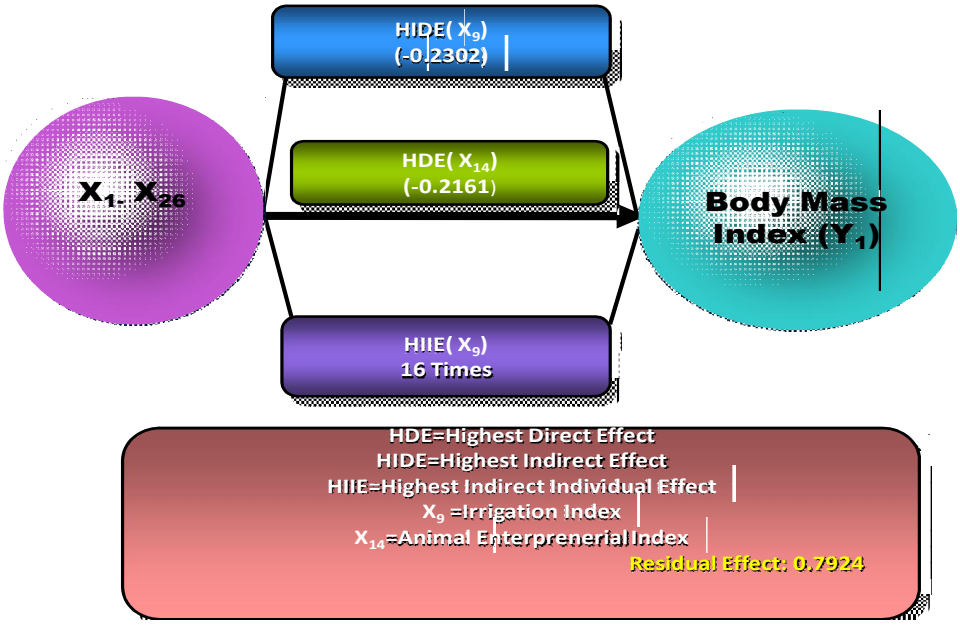
The residual effect being 0.7924, it is to infer that even with the combination of 26 exogenous variables 21 percent of variance embedded in the consequent variable, Body Mass Index ($Y_1$) has been explained so far.

**Table 2. Path analysis of Body Mass Index ($Y_1$) versus 26 independent variables**

N=211

| Variables | TE | TDE | TIE | Substantial Indirect Effect | | |
|---|---|---|---|---|---|---|
| | | | | I | II | III |
| Age($X_1$) | 0.2125 | 0.1679 | 0.0446 | 0.0371($X_9$) | -0.0357( $X_4$) | 0.0349($X_{18}$) |
| Education( $X_2$) | 0.0263 | 0.0027 | 0.0236 | 0.0934($X_{18}$) | -0.0860( $X_4$) | 0.0336($X_{23}$) |
| Family statement( $X_3$) | 0.0347 | -0.0715 | 0.1062 | 0.0597($X_1$) | 0.0356($X_{11}$) | 0.0276($X_{16}$) |
| Family education( $X_4$) | 0.0976 | -0.1250 | 0.2226 | 0.1109($X_{18}$) | 0.0479($X_1$) | 0.0375($X_{17}$) |
| Homestead land( $X_5$) | 0.0185 | 0.0002 | 0.0183 | 0.0553($X_{17}$) | 0.0520($X_7$) | -0.0486($X_9$) |
| Cultivated land( $X_6$) | 0.1141 | -0.0276 | 0.1417 | 0.1474($X_{17}$) | -0.1152($X_9$) | 0.1129($X_7$) |
| Land under irrigation($X_7$) | 0.1183 | 0.1138 | 0.0045 | 0.1482($X_{17}$) | -0.1161($X_9$) | 0.0610($X_{13}$) |
| Cropping intensity($X_8$) | -0.0052 | -0.1219 | 0.1167 | 0.2204($X_{17}$) | -0.2028($X_9$) | 0.0771($X_{13}$) |
| Irrigation index($X_9$) | -0.0053 | -0.2161 | 0.2108 | 0.2294 $X_{17}$) | -0.1144($X_8$) | 0.0794($X_{13}$) |
| Expenditure index (Education &Others)($X_{10}$) | -0.1116 | -0.0132 | -0.0984 | -0.0510($X_{11}$) | -0.0356($X_9$) | -0.0327($X_1$) |
| Expenditure index (Food & Health)($X_{11}$) | -0.1218 | -0.1319 | 0.0101 | 0.0674($X_{17}$) | -0.0382($X_9$) | -0.0352($X_1$) |
| Owner agricultural implements($X_{12}$) | -0.1138 | 0.0462 | -0.16 | -0.0838($X_9$) | 0.0749($X_{17}$) | -0.0542($X_8$) |
| Technology socialization status($X_{13}$) | 0.1482 | 0.1289 | 0.0193 | 0.1517($X_{17}$) | -0.1332($X_9$) | -0.0729($X_8$) |
| Animal entrepreneurial index($X_{14}$) | -0.1779 | 0.0523 | -0.2302 | -0.0977($X_{16}$) | 0.0403($X_9$) | -0.0369($X_1$) |
| Animal production consumption index($X_{15}$) | -0.1204 | -0.1019 | -0.0185 | -0.0618($X_{16}$) | 0.0481($X_9$) | 0.0432($X_{18}$) |
| Animal production sale index($X_{16}$) | -0.1456 | -0.1424 | -0.0032 | -0.0442($X_{15}$) | 0.0359($X_{14}$) | -0.0250($X_1$) |
| Crop diversification index($X_{17}$) | 0.1072 | 0.2863 | -0.1791 | -0.1732($X_9$) | -0.0938($X_8$) | 0.0683($X_{13}$) |
| Media-social interaction index($X_{18}$) | 0.1972 | 0.1879 | 0.0093 | -0.0738( $X_4$) | 0.0419($X_{13}$) | 0.0399($X_{17}$) |
| Market interaction($X_{19}$) | -0.1273 | -0.0965 | -0.0308 | -0.0421($X_9$) | 0.0350($X_{17}$) | -0.0323($X_1$) |
| Enterpreneral interaction($X_{20}$) | -0.0998 | -0.0217 | -0.0781 | -0.0743($X_{21}$) | -0.0236( $X_4$) | 0.0220($X_{16}$) |
| Capacity building index($X_{21}$) | -0.1163 | -0.1257 | 0.0094 | -0.0403( $X_4$) | 0.0395($X_{18}$) | 0.0267($X_1$) |
| Credit rotation index($X_{22}$) | 0.0532 | 0.0401 | 0.0131 | 0.1197($X_{17}$) | -0.1037($X_9$) | 0.0566($X_{13}$) |
| Distance of road($X_{23}$) | -0.1280 | -0.1071 | -0.0209 | -0.0632($X_{18}$) | 0.0435( $X_4$) | -0.0431($X_9$) |
| Status of sanitation index($X_{24}$) | 0.0327 | 0.0395 | -0.0068 | -0.0296($X_9$) | 0.0235($X_{17}$) | 0.0183($X_{25}$) |
| Distance matrix($X_{25}$) | -0.0519 | -0.0688 | 0.0169 | -0.0345($X_{21}$) | -0.0328($X_{17}$) | -0.0214($X_{11}$) |
| Health index($X_{26}$) | -0.0662 | -0.0276 | -0.0386 | -0.0242($X_{11}$) | -0.0188($X_{17}$) | -0.0186($X_{16}$) |
| Residual Effect | | | | 0.7924 | | |
| Highest Count | | | | Irrigation index($X_9$):16 | | |

**Model-2 Path analysis of Body Mass Index ($Y_4$) versus 26 independent variables**



**Revelation**

The respondents, the farm women, record better body mass index (BMI) where in the substantive contribution is made by animal entrepreneurial. So, farm women having a modern farm supported with irrigating system with mechanization, have bestowed better body mass index (BMI) only when they are also having livestock entrepreneurial.

**Conclusion**

Body mass index (BMI) does not only present bio-physical parameters towards estimating any health status but also indicates the socio-economic echelons the subject is belonging to and confronting with. It reflects both the economic and social status, bio physical and functional access to basic social processes. The present study uniquely reveals the components of agro-ecological dynamics as to how it would support and sustain the nutritional status of farm women. Animal enterprise, when being an integral part of farming system, can be a splendid synergy attuned to the nutritional behavior of farm women. The other scenario variables including irrigation index, technology socialization and age etc can contribute towards attaining a better health status and delineate a strong background for estimation of the causal variables impacting on nutritional level, calorie intake property and general health status.

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