# Hemoglobin Status of Farm Women in Rural India: An Analysis through Score of Socio-Economic and Agro-ecological Correlates

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**Abstract—***Hemoglobin level estimation of blood is an important nutrition indicator of women. In India there has been minimal research on farm women's hemoglobin level which indicates anemia to them. The present study was thus conducted of 211 farm women with the objective to assess the agro-socio-economic factors related to hemoglobin content of farm women, of West Bengal, India. The study was confined to the women of age group of 19-60 years. Their hemoglobin level was measured by collecting blood samples from the respondents through cyanmethemoglobin method. This present paper assesses the socio-economic and agro-ecological predictors to a score of 26 exogenous variables which are correlated with the hemoglobin status of farm women. Multivariate analysis was carried out to understand the complex nature of variable interaction. It shows cultivated land ($X_6$) have maximum contribution to the hemoglobin status of farm women.*

**Keywords***: Cultivated land, Farm women, Hemoglobin, India*

## 1. INTRODUCTION

Anemia may be defined as qualitative or quantitative deficiency of hemoglobin, also a form of malnutrition, is a major public health problem especially in the low-income countries where it is highly prevalent. Among these Iron-deficiency anemia is the most common in the worldwide and is the eighth leading cause of disease in girls and women in developing countries (World Bank 1993). In India, two- thirds of the women of child bearing age are estimated to suffer from iron deficiency anemia and 15 per cent of all maternal deaths are attributed to anemia (IIPS 2007; Chakma 2000; National Nutrition Monitoring Bureau 2002; Micronutrient Initiative 2007). Anemia is associated with increased mortality ( Zakai et al., 2005, Penninx et al., 2006, Culleton et al., 2006, Dong et al., 2008) disability, and poorer physical performance such as reduced working capacity, defective immune response, impairment of learning ability and physical fitness (Penninx et al., 2004) regardless of the underlying cause of the low hemoglobin. In spite of several anemia preventing programmes, there is no significant decline in the prevalence of anemia in India.

Lack of knowledge about dietary requirements and consumption of iron containing foods is an important contributory cause of widespread occurrence of anemia among vulnerable section of the population in the developing countries. Several studies have found a negative association between socioeconomic situation (SES) and anemia prevalence. Women from poor households are usually found to have higher anemia prevalence. Poor SES is known to be associated with a number of factors such as high parity, short birth interval, poor diet both in quantity and quality, lack of health and nutrition awareness, and a high rate of infectious diseases and parasitic infestations. The present study was thus planned to assess the socio-economic and agro-ecological factors related to hemoglobin content of farm women, of West Bengal, India.

## 2. 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 test the hemoglobin content of the

blood of the samples 5 ml of blood was collected from the sample by a trained person on permission by ethical committee of the Calcutta University. To know the hemoglobin content the blood samples were tested by cyanmethemoglobin method and the result has been collected in gm/dl.

## 3. 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 size, $X_4$-Family education, $X_5$- Homestead land(bigha), $X_6$-Cultivated land (bigha), $X_7$- Land under irrigation (bigha), $X_8$- Cropping intensity, $X_9$- Irrigation index, $X_{10}$-Expenditure index (Education & Others), $X_{11}$- Expenditure index (Food & Health), $X_{12}$- Ownership of 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-$Y_1$- Hemoglobin level .

## 4. RESULTS AND DISCUSSION

**Table 1: Correlation coefficient of Hemoglobin level (Y) with 26 independent variables**

| | N=211 |
|---|---|
| Age($X_1$) | 0.2087** |
| Education( $X_2$) | 0.1579* |
| Family size( $X_3$) | 0.0759 |
| Family education( $X_4$) | 0.2557** |
| Homestead land( $X_5$) | -0.1474* |
| Cultivated land( $X_6$) | -0.1463* |
| Land under irrigation($X_7$) | -0.1370 |
| Cropping intensity($X_8$) | -0.1852** |
| Irrigation index($X_9$) | -0.1518* |
| Expenditure index (Education &Others)($X_{10}$) | 0.2981** |
| Expenditure index (Food & Health)($X_{11}$) | -0.3830** |
| Owner agricultural implements($X_{12}$) | -0.1752* |
| Technology socialization status($X_{13}$) | 0.0593 |
| Animal entrepreneurial index($X_{14}$) | -0.3772** |
| Animal production consumption index($X_{15}$) | 0.0709 |
| Animal production sale index($X_{16}$) | -0.1859** |
| Crop diversification index($X_{17}$) | -0.1253 |
| Media-social interaction index($X_{18}$) | 0.1426* |
| Market interaction($X_{19}$) | 0.0004 |
| Entrepreneurial interaction($X_{20}$) | 0.0835 |
| Capacity building index($X_{21}$) | 0.0829 |
| Credit rotation index($X_{22}$) | 0.0123 |
| Distance of road($X_{23}$) | -0.1169 |
| Status of sanitation index($X_{24}$) | -0.0797 |
| Distance matrix($X_{25}$) | 0.0567 |
| Health index($X_{26}$) | -0.0504 |
| *significant at 0.05 level<br>**significant at 0.01 level | |

Table-1 presents the coefficient of correlation between Hemoglobin level(Y) and 26 independent variables of total 4 villages. It has been found that the variables Age ($X_1$), Education ($X_2$), Family education ($X_4$), Homestead land ($X_5$), Cultivated land ($X_6$), Cropping intensity ($X_8$), Irrigation index ($X_9$), Expenditure index (Education & Others) ($X_{10}$), Expenditure index (Food & Health) ($X_{11}$), Owner agricultural implements ($X_{12}$,) Animal entrepreneurial index ($X_{14}$), Animal production sale index ($X_{16}$) and Media-social interaction index ($X_{18}$) have been significantly correlated with the dependent variable Hemoglobin level (Y).

**Table 2: Stepwise regression analysis Hemoglobin level (Y) versus 26 independent variables: Predominating variables retained at the last step**

| Predictors | B | S.E | Beta×R | t | $R^2$ |
|---|---|---|---|---|---|
| Family education( $X_4$) | 0.16 | 0.18 | 14.52 | 2.53 | 0.28 |
| Cropping intensity($X_8$) | -0.18 | 0.01 | 11.91 | 2.46 | |
| Expenditure index (Education &Others)($X_{10}$) | -0.17 | 0.00 | 18.31 | 2.65 | |
| Expenditure index (Food & Health)($X_{11}$) | -0.20 | 0.00 | 27.43 | 3.05 | |
| Technology socialization status($X_{13}$) | 0.15 | 0.00 | 3.22 | 2.00 | |
| Animal entrepreneurial index($X_{14}$) | -0.18 | 0.20 | 24.59 | 2.83 | |

Table 2 presents the stepwise regression analysis as to extract some few causal variables out of 26 variables having substantive impact on Hemoglobin level (Y). It have been found that the following variables retained at the last stage having substantive causal effect on livelihood of the farm women *viz.* Family education( $X_4$), Cropping intensity($X_8$), Expenditure index (Education &Others)($X_{10}$), Expenditure index (Food & Health)($X_{11}$), Technology socialization status($X_{13}$) and Animal entrepreneurial index($X_{14}$).The conglomeration of these few variables selected through step down regression analysis has got 28 percent contribution to the variance in consequent variables, hemoglobin level and quite logically these variables are retaining immense, strategic

importance of microlevel planning for estimating and influencing hemoglobin level(Y) of farm women.

**Table 3: Path analysis of Hemoglobin level (Y) versus 26 independent variables**

| | | | | | | N=211 |
|---|---|---|---|---|---|---|
| **Variables** | **TE** | **TDE** | **TIE** | **Substantial Indirect Effect** | | |
| | | | | **I** | **II** | **III** |
| Age($X_1$) | 0.2087 | 0.0334 | 0.1753 | **0.1203($X_6$)** | -0.0907($X_7$) | 0.0888($X_9$) |
| Education($X_2$) | 0.1579 | -0.0709 | 0.2288 | 0.1984($X_{18}$) | -0.1098($X_4$) | 0.0109($X_{13}$) |
| Family size($X_3$) | 0.0759 | -0.0214 | 0.0973 | -0.0531($X_{14}$) | 0.0521($X_9$) | 0.0261($X_{18}$) |
| Family education($X_4$) | 0.2557 | 0.2088 | 0.0469 | 0.2355($X_{18}$) | **0.1664($X_6$)** | -0.1305($X_7$) |
| Homestead land($X_5$) | -0.1474 | 0.0863 | -0.2337 | **-0.2516($X_6$)** | 0.1613($X_7$) | -0.0718($X_8$) |
| Cultivated land($X_6$) | -0.1463 | **-0.5445** | 0.3982 | 0.3505($X_7$) | -0.1726($X_8$) | 0.1618($X_9$) |
| Land under irrigation($X_7$) | -0.1370 | 0.3533 | **-0.4903** | **-0.5407($X_6$)** | -0.1739($X_8$) | 0.1631($X_9$) |
| Cropping intensity($X_8$) | -0.1852 | -0.3739 | 0.1887 | 0.2849($X_9$) | **-0.2514($X_6$)** | 0.1643($X_7$) |
| Irrigation index($X_9$) | -0.1518 | 0.3036 | -0.4554 | -0.3509($X_8$) | **-0.2901($X_6$)** | 0.1898($X_7$) |
| Expenditure index (Education &Others)($X_{10}$) | 0.2981 | -0.1711 | 0.4692 | **-0.1354($X_6$)** | 0.0908($X_{11}$) | 0.0884($X_7$) |
| Expenditure index (Food & Health)($X_{11}$) | -0.3830 | -0.2347 | -0.1483 | **-0.0922($X_6$)** | -0.0767($X_{14}$) | -0.0625($X_8$) |
| Owner agricultural implements($X_{12}$) | -0.1752 | -0.0632 | -0.112 | -0.1664($X_8$) | 0.1177($X_9$) | 0.0803($X_{12}$) |
| Technology socialization status($X_{13}$) | 0.0593 | 0.1275 | -0.0682 | **-0.2544($X_6$)** | -0.2236($X_8$) | 0.1872($X_9$) |
| Animal entrepreneurial index($X_{14}$) | -0.3772 | -0.2422 | -0.135 | -0.0743($X_{11}$) | -0.0637($X_8$) | -0.0636($X_7$) |
| Animal production consumption index($X_{15}$) | 0.0709 | 0.1275 | -0.0566 | 0.0759($X_8$) | -0.0676($X_9$) | **0.0562($X_6$)** |
| Animal production sale index($X_{16}$) | -0.1859 | -0.0023 | -0.1836 | -0.1661($X_{14}$) | 0.0553($X_{15}$) | -0.0349($X_{11}$) |
| Crop diversification index($X_{17}$) | -0.1253 | 0.0074 | -0.1327 | -0.2879($X_8$) | **-0.2804($X_6$)** | 0.1673($X_7$) |
| Media-social interaction index($X_{18}$) | 0.1426 | -0.0221 | 0.1647 | 0.1232($X_4$) | **-0.0968($X_6$)** | 0.0605($X_7$) |
| Market interaction($X_{19}$) | 0.0004 | 0.0323 | -0.0319 | **-0.0749($X_6$)** | -0.0611($X_8$) | 0.0592($X_9$) |
| Enterpreneral interaction($X_{20}$) | 0.0835 | 0.0495 | 0.034 | -0.0892($X_8$) | 0.0463($X_7$) | 0.0395($X_4$) |
| Capacity building index($X_{21}$) | 0.0829 | 0.0182 | 0.0647 | 0.0674($X_4$) | -0.0361($X_{11}$) | 0.0352($X_{10}$) |
| Credit rotation index($X_{22}$) | 0.0123 | 0.0763 | -0.064 | -0.1717($X_8$) | 0.1456($X_9$) | **-0.1398($X_6$)** |
| Distance of road($X_{23}$) | -0.1169 | 0.0561 | -0.173 | **-0.0733($X_6$)** | -0.0727($X_4$) | -0.0705($X_{18}$) |
| Status of sanitation index($X_{24}$) | -0.0797 | -0.0032 | -0.0765 | **-0.0646($X_6$)** | -0.0529($X_8$) | 0.0416($X_9$) |
| Distance matrix($X_{25}$) | 0.0567 | 0.0811 | -0.0244 | -0.0381($X_{11}$) | 0.0321($X_4$) | 0.0310($X_{14}$) |
| Health index($X_{26}$) | -0.0504 | 0.1088 | -0.1592 | -0.0430($X_{11}$) | -0.0234($X_{10}$) | -0.0217($X_4$) |
| Residual Effect | **0.6563** | | | | | |
| Highest Count | **Cultivated land( $X_6$):16** | | | | | |

Table 3 presents the path analysis of consequent variable, Hemoglobin level (Y) 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, Cultivated land($X_6$) has exerted highest total direct effect and the other exogenous variable Land under irrigation($X_7$) has exerted highest total indirect effect on the consequent variable, Hemoglobin level (Y).The table also revealed that the exogenous variable, Cultivated land($X_6$) 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, Hemoglobin level (Y).The residual effect being 0.6563, it is to infer that even with the combination of 26 exogenous variables 35 percent of variance embedded in the consequent variable, Hemoglobin level (Y).

## 5. CONCLUSION

The paper studies the sociology of nutrition in the context of sociology nutrition of farm women in the context of transforming rural economy and agriculture. The empirical evidences show that the farm ecological components, cultivated land, irrigation status, are making pathways into the complex interaction of rural health eco-system. The farm women supported by better land resources, irrigated agro-eco system and income have bestowed higher hemoglobin content viz. better health status. There is constant osmosis between social ecology and bio-physical transformations wherein nutrition and health play the pivotal in brining resilience in the entire ecosystem. The same study can be cloned in the similar social ecology, might be different gender and age category to justify its reliability and applicability and also to conclude in the most realistic manner.

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