Ecology of Farming and the Health Issues of Farmwomen: The Dynamics and Interplay of Performing Variables

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Abstract—*In India majority of the female workforce is in agriculture and women play "multidimensional role" in Indian agriculture system. Food and Agriculture Organization estimates that "women produce between 60 and 80 per cent of the food in most developing countries and are responsible for half of the world's food production". It is fact that women's immense contribution to household food security in India remains largely invisible. It is now well established fact that environmental degradation has affected women's lives in ways different from men. Women have been identified as main victims of overall ecological degradation by many environmentalists, and this has been mainly attributed to the fact that they are responsible for producing, processing and gathering food, fetching water and carrying fuelwood. To identify the interplay of the performing variables of ecology of farming and the health issues of farm women in India, this study has been undertaken in the Nadia District of West Bengal. In this study for understanding the role socio-ecological variables on Income, Livelihood and Health factors like Body mass Index, Haemoglobin level and Calorie intake several correlations and interrelation has done. Path analysis and regression analysis was also done for identifying the variables which have substantive effect on this issues. From the result it was found variables viz. Cultivated land, Irrigation index, Animal production consumption index, Animal production sale index and Media-social interaction index have substantive causal effect on livelihood of the farm women whereas variables viz. Family size, Cultivated land, Irrigation index, Expenditure index (Food & Health), Owner agricultural implements, Crop diversification index, Media-social interaction index and Distance matrix have substantive causal effect on income of the farm women. On the issues of health of farm women Family education, Cropping intensity, Expenditure index (Education &Others), Expenditure index (Food & Health), Technology socialization status and Animal entrepreneurial index have substantive effect on Haemoglobin and Age, Animal production consumption index, Media-social interaction index, and Capacity building index on Body Mass Index and Irrigation index, Expenditure index (Food & Health), Crop diversification index, Media-social interaction index and Market interaction also have on Calorie Intake. It is ultimately found from the study that Haemoglobin and calorie intake, one of the indicators of nutrition, have moved together whereas Livelihood, Income Index, Body Mass Index have formed a conglomeration based on their homogeneity of interactions. So on farming system if agro-ecological factors can be given importance during policy making of farm women these health issues should be corrected.*

1. INTRODUCTION

India is a developing country. Agriculture is the vertical backbone of this country. Major part of the country's population earns its livelihood from agriculture. According to 2012 data Indian is home to the fourth largest agricultural sector in the world. Nearly 70% of Indian rural women are employed in agriculture and they are responsible for 60-80 percent of total food production. Rural women have significant role in cultivation, dairy, fisheries, crop processing and other allied areas. Traditionally, women have always played an important role in agriculture- as farmers, co-farmers, wage labours and managers of farms. They have conventionally been producers of food from seed to kitchen. They carry the heavier work burden in food production and because of gender discrimination, get lower returns for their work. The multiple role of women leads to a significant contribution in real terms to the productive system.

Swaminathan, the famous agricultural scientist describes that it was woman who first domesticated crop plants and thereby initiated the art and science of farming. While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating those of interest from the point of view of food, feed, fodder, fibre and fuel. Women have played and continue to play a key role in the conservation of basic life support systems such as land, water, flora and fauna. They have protected the health of the soil through organic recycling and promoted crop security through the maintenance of varietal diversity and genetic resistance.

It is fact that women's immense contribution to household food security in India remains largely invisible. It is now well established fact that environmental degradation has affected

women's lives in ways different from men. Women have been identified as main victims of overall ecological degradation by many environmentalists, and this has been mainly attributed to the fact that they are responsible for producing, processing and gathering food, fetching water and carrying fuelwood. To identify the interplay of the performing variables of ecology of farming and the health issues of farm women in India, this study has been undertaken in the Nadia District of West Bengal. In this study for understanding the role socio-ecological variables on Income, Livelihood and Health factors like Body mass Index, Haemoglobin level and Calorie intake several correlations and interrelation has done.

2. METHODOLOGY

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.

The empirical measurement of the livelihood has been conducted through calculating the wage (daily income), mandays, manpower index, and level of decency of the work.

In this context income is such an important factor has been determined in this present study only in term of Rupees what the respondent do income in a year.

The cyanmethemoglobin is recommended by the Technical Subcommittee on Hemoglobinometry of the International Committee for assessing Hemoglobin content in blood. In this present study this method has been followed.

Diet survey using 24 hours recall method was done for assessing the actual amount of food what was consumed by each respondent in a day. The daily intakes of calories were calculated from the records collected from farm women.

According to WHO Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (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}- 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 , X_{27}- Income and the dependent variables are- Y_1- Livelihood, Y_2-Income Index, Y_3-Haemoglobin level, Y_4-Body mass Index and Y_5-Calorie Intake.

Results

Table-1 presents the coefficient of correlation between livelihood (Y_1) & 26 independent variables of total 4 villages.

Results:- It has been found that the variables Education(X_2), Family education(X_4), Cropping intensity(X_8), Irrigation index(X_9), Expenditure index (Education &Others)(X_{10}), Ownership of agricultural implements(X_{12}), Animal production consumption index(X_{15}), Animal production sale index(X_{16}), Media-social interaction index(X_{18}), Market interaction(X_{19}) and Distance of road(X_{23}) have come out significantly correlated to the dependent variable livelihood (Y_1).

Revelation:-

Educations(X2) as well as collective family education(X4) have gone significantly correlated with livelihood. So respondents having higher education score have earn better livelihood. The respondents having low score on the following correlates Cropping intensity(X_8), Irrigation index(X_9) and Ownership of agricultural implements(X_{12}) have been unique for better livelihood. The other variable animal production consumption index(X_{15}) and animal production sale index(X_{16})have also been found significantly and positively correlated to livelihood. So, cattle management by its very nature has been able to generate more livelihoods over crop enterprise. And it has also been reflected that where there has been higher animal production sale index(X_{16}), the livelihood that gone up substantially. In general the animal enterprise has been able to lead the farm families with intensive livelihood generation and at the same time higher sale of animal production i.e milk, egg etc.The respondents having higher exposure to Media-social interaction index(X_{18}), have also been able to generate better livelihood.

The other two variables Market interaction(X_{19}) and Distance of road(X_{23}) have been found to have negative correlation with livelihood generation by decomposing this relationship into

direct and indirect effect , a logical conclusion only be possible to justify this pattern of relationship.

Table 1: Correlation coefficient of Livelihood (Y_1) with 26 independent variables of Total 4 villages, Nadia, West Bengal

N=211	
Age(X_1)	0.1246
Education(X_2)	0.2245**
Family size(X_3)	-0.0366
Family education(X_4)	0.2218**
Homestead land(X_5)	0.0545
Cultivated land(X_6)	0.1082
Land under irrigation(X_7)	0.0936
Cropping intensity(X_8)	-0.2251**
Irrigation index(X_9)	-0.2371**
Expenditure index (Education &Others)(X_{10})	0.1515*
Expenditure index (Food & Health)(X_{11})	0.0545
Ownership of agricultural implements(X_{12})	-0.2313**
Technology socialization status(X_{13})	0.0552
Animal entrepreneurial index(X_{14})	0.0836
Animal production consumption index(X_{15})	0.1483*
Animal production sale index(X_{16})	0.2760**
Crop diversification index(X_{17})	-0.0781
Media-social interaction index(X_{18})	0.4678**
Market interaction(X_{19})	-0.2083**
Entrepreneurial interaction(X_{20})	-0.0429
Capacity building index(X_{21})	0.0859
Credit rotation index(X_{22})	-0.0182
Distance of road(X_{23})	-0.2025**
Status of sanitation index(X_{24})	-0.0437
Distance matrix(X_{25})	0.0994
Health index(X_{26})	-0.0348
*significant at 0.05 level **significant at 0.01 level	

Table-2 presents the coefficient of correlation between Income index (Y_2) & 26 independent variables of total 4 villages.

Results:- It has been found that the variables Education(X_2), Family size X_3), Family education(X_4), Homestead land(X_5),Cultivated land(X_6), Land under irrigation(X_7), Expenditure index (Education &Others)(X_{10}), Expenditure index (Food & Health)(X_{11}), Owner agricultural implements(X_{12}, Technology socialization status(X_{13}), Crop diversification index(X_{17}), Media-social interaction index(X_{18}), Capacity building index(X_{21}), Distance matrix(X_{25}) have come out significantly correlated to the dependent variable Income index (Y_2).

Table 2: Correlation coefficient of Income index (Y_2) with 26 independent variables of Total 4 villages, Nadia, West Bengal

N=211	
Age(X_1)	-0.0351
Education(X_2)	0.1901**
Family size(X_3)	-0.2871**
Family education(X_4)	0.1661*
Homestead land(X_5)	0.1406*
Cultivated land(X_6)	0.3456**
Land under irrigation(X_7)	0.3413**
Cropping intensity(X_8)	0.0553
Irrigation index(X_9)	0.0762
Expenditure index (Education &Others)(X_{10})	0.2816**
Expenditure index (Food & Health)(X_{11})	0.4190**
Ownership of agricultural implements(X_{12})	-0.2247**
Technology socialization status(X_{13})	0.2381**
Animal entrepreneurial index(X_{14})	0.0019
Animal production consumption index(X_{15})	0.0581
Animal production sale index(X_{16})	0.0649
Crop diversification index(X_{17})	0.2427**
Media-social interaction index(X_{18})	0.3070**
Market interaction(X_{19})	-0.0969
Entrepreneurial interaction(X_{20})	0.0728
Capacity building index(X_{21})	0.1407*
Credit rotation index(X_{22})	0.0864
Distance of road(X_{23})	-0.0568
Status of sanitation index(X_{24})	-0.0305
Distance matrix(X_{25})	0.2645**
Health index(X_{26})	-0.0021
*significant at 0.05 level **significant at 0.01 level	

Revelation:- The higher family size (X_3) in this village has contributed to smaller family income as well by providing more per capita income, that's why the correlation has been found in negative direction. The education(X_2) and Family education (X_4) have added a positive direction on higher income. So education as a whole has got a positive & cumulative impact on family income of the respondents. The agro ecological variables homestead land(X_5), cultivated land(X_6), land under irrigation(X_7) have been found a positive and significantly correlated with income. The villages by becoming a one of the most advanced village in the adjoining blocks in terms of agricultural modernization and diversification with higher cropping intensity(X_8) and irrigation index(X_9) have been able in setting the income index (Y_2) to a higher echelon. The expenditure index (Food & Health) (X_{11}) and Expenditure index (Education &Others) (X_{10}) have positively been associated with income to imply that better allocation of expenditure (food & health), Expenditure (Education &Others) is possible only when the income goes on. Owner agricultural implements(X_{12}) is negatively correlated with the income. The technology socialization status(X_{13}) has also been better for the respondents having higher income. That's why they have recorded a positive & significant correlation with income. The respondents are having higher crop diversification(X_{17}), they are managing the risk better and hence assure a better income. The other variables show that the respondents are of higher income those who are widely interactive with media(X_{18}), higher Capacity building index(X_{21}). So, the better capacity building character and media interactions have lead the respondents to generate better income. It is to also note that

distance matrix (X_{25}) is also correlated with income and play a important role on rural life.

TABLE NO.-3: Correlation coefficient of Haemoglobin level (Y_3) with 26 independent variables of Total 4 villages, Nadia, West Bengal

N=211	
Age(X1)	0.2087**
Education(X2)	0.1579*
Family statement(X3)	0.0759
Family education(X4)	0.2557**
Homestead land(X5)	-0.1474*
Cultivated land(X6)	-0.1463*
Land under irrigation(X7)	-0.1370
Cropping intensity(X8)	-0.1852**
Irrigation index(X9)	-0.1518*
Expenditure index (Education &Others)(X10)	0.2981**
Expenditure index (Food & Health)(X11)	-0.3830**
Ownership of agricultural implements(X12)	-0.1752*
Technology socialization status(X13)	0.0593
Animal entrepreneurial index(X14)	-0.3772**
Animal production consumption index(X15)	0.0709
Animal production sale index(X16)	-0.1859**
Crop diversification index(X17)	-0.1253
Media-social interaction index(X18)	0.1426*
Market interaction(X19)	0.0004
Entrepreneurial interaction(X20)	0.0835
Capacity building index(X21)	0.0829
Credit rotation index(X22)	0.0123
Distance of road(X23)	-0.1169
Status of sanitation index(X24)	-0.0797
Distance matrix(X25)	0.0567
Health index(X26)	-0.0504
*significant at 0.05 level **significant at 0.01 level	

Table-3 presents the coefficient of correlation between Haemoglobin level(Y_3) & 26 independent variables of total 4 villages.

Results:- 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}), Ownership of 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 Haemoglobin(%)(Y_3).

Revelation:-Chronologically age(X_1) has got an implication on haemoglobin status, only when the other possible factors are being considered.

Education(X_2) provides the basic input of scientific concept on nutritional practices, hygiene, and behavior and calorie intake properties by an individual.Family education ($X4$) has got a decisive impact on the haemoglobin status of family member. Both homestead land(X_5) and cultivated land(X_6) have got a negative impact on haemoglobin content of the respondents. Cropping intensity(X_8) and Irrigation index(X_9) also has got a

negative impact bearing on haemoglobin content of the respondents. This indicates that the respondents having higher haemoglobin level have got a lower cropping intensity and lower irrigation index. Expenditure index has source of interesting relationship. Expenditure index (Education &Others)(X_{10})has got impact as well as the Expenditure index (Food & Health)(X_{11})The other variable Ownership of agricultural implements(X_{12}), Animal entrepreneurial index(X_{14}) and Animal production sale index(X_{16}) all have got a negative bearing on haemoglobin percentage. This relationship needs to be decomposed through path analysis. It is of course the variety media-social interaction index(X_{18}) having got a positive impact on haemoglobin content.

Table 4: Correlation coefficient of Body Mass Index (Y_4) with 26 independent variables of Total 4 villages, Nadia, West Bengal

N=211	
Age(X1)	0.2125**
Education(X2)	0.0263
Family size(X3)	0.0347
Family education(X4)	0.0976
Homestead land(X5)	0.0185
Cultivated land(X6)	0.1141
Land under irrigation(X7)	0.1183
Cropping intensity(X8)	-0.0052
Irrigation index(X9)	-0.0053
Expenditure index (Education &Others)(X10)	-0.1116
Expenditure index (Food & Health)(X11)	-0.1218
Ownership of agricultural implements(X12)	-0.1138
Technology socialization status(X13)	0.1482*
Animal entrepreneurial index(X14)	-0.1779*
Animal production consumption index(X15)	-0.1204
Animal production sale index(X16)	-0.1456*
Crop diversification index(X17)	0.1072
Media-social interaction index(X18)	0.1972**
Market interaction(X19)	-0.1273
Entrepreneurial interaction(X20)	-0.0998
Capacity building index(X21)	-0.1163
Credit rotation index(X22)	0.0532
Distance of road(X23)	-0.1280
Status of sanitation index(X24)	0.0327
Distance matrix(X25)	-0.0519
Health index(X26)	-0.0662
*significant at 0.05 level **significant at 0.01 level	

Table-4 presents the coefficient of correlation between Body Mass Index (Y_4) & 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_4).

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

Table-5 presents the coefficient of correlation between Calorie intake (Y_5) & 26 independent variables of total 4 villages.

Results:- It has been found that the variables Education(X_2), Family sizet(X_3), Expenditure index (Education &Others)(X_{10}), Expenditure index (Food & Health)(X_{11}), Media-social interaction index(X_{18}), Market interaction(X_{19}), Capacity building index(X_{21}), Distance of road(X_{23}) are significantly correlated with the dependent variable Calorie intake (Y_5).

Revelation:-

Education(X_2) has recorded a negative impact which implies that respondents having lower education level, more down to earth people and close in nature , have got better calorie intake level. Higher the family size(X_3), the higher has been a routinised food and a nutritional schedule in the rural areas. The domestic chores are well distributed, hence nutritional rationing has been patterned and customized , relatively than the single rural families.The two variables Expenditure index (Education &Others)(X_{10}) and Expenditure index (Food & Health)(X_{11}) are negatively correlated with the Body Mass Index and this relation needs to undergo a path composition to examine whether some companion variables are there to ratify this relationship. Following variables Technology socialization status(X_{13}), Media-social interaction index(X_{18}), Capacity building index(X_{21}) have got negative bearings with Body Mass Index, which could have been positive in normal situation. So path analysis can help and understand whether there is any negative influence generating from companion variables. Better Market interaction(X_{19}) and higher accessibility(X_{23}) have got the positive contribution towards attaining calorie intake.

Table 5: Correlation coefficient of Calorie intake (Y_5) with 26 independent variables of Total 4 villages, Nadia, West Bengal

N=211	
Age(X_1)	-0.0285
Education(X_2)	-0.1806*
Family size(X_3)	0.1520*
Family education(X_4)	-0.2113
Homestead land(X_5)	-0.0383
Cultivated land(X_6)	-0.0691
Land under irrigation(X_7)	-0.0523
Cropping intensity(X_8)	-0.0283
Irrigation index(X_9)	-0.0488
Expenditure index (Education &Others)(X_{10})	-0.1475*
Expenditure index (Food & Health)(X_{11})	-0.2305**
Owner agricultural implements(X_{12})	0.1159
Technology socialization status(X_{13})	-0.1689*
Animal entrepreneurial index(X_{14})	0.0324
Animal production consumption index(X_{15})	0.0209
Animal production sale index(X_{16})	-0.0169
Crop diversification index(X_{17})	-0.0103
Media-social interaction index(X_{18})	-0.2824**
Market interaction(X_{19})	0.2470**
Entrepreneurial interaction(X_{20})	-0.0714
Capacity building index(X_{21})	-0.1545*
Credit rotation index(X_{22})	-0.1018
Distance of road(X_{23})	0.1858**
Status of sanitation index(X_{24})	0.0209
Distance matrix(X_{25})	-0.0870
Health index(X_{26})	0.0401
*significant at 0.05 level	
**significant at 0.01 level	

Revelation: Table 6 presents the stepwise regression analysis as to extract some few causal variables out of 26 variables having substantive impact on livelihood (Y_1) generation. It have been found that the following variables retained at the last stage having substantive causal effect on livelihood of the farm women *viz.* Cultivated land(X_6), Irrigation index(X_9), Animal production consumption index(X_{15}), Animal production sale index(X_{16}) and Media-social interaction index(X_{18}).The conglomeration of these few variables selected through step down regression analysis has got 39.27% contribution to the variance in consequent variables, livelihood and quite logically these variables are retaining immense, strategic importance of micro level planning for estimating and influencing livelihood (Y_1)of farm women.

Table 6: Stepwise regression analysis Livelihood (Y_1) versus 26 independent variables of Total 4 villages, Nadia, West Bengal: Predominating variables retained at the last step

Predictors	B	S.E	BetaXR	t	R2
Cultivated land (X_6)	0.207	0.078	5.707	3.134	
Irrigation index(X_9)	-0.396	0.005	23.930	5.948	0.392
Animal production consumption index(X_{15})	-0.169	0.053	-6.367	2.606	
Animal production sale index(X_{16})	0.342	0.028	24.014	5.549	
Media-social interaction index(X_{18})	0.443	0.013	52.716	7.688	

Table 7: Stepwise regression analysis Income index (Y₂) versus 26 independent variables of Total 4 villages, Nadia, West Bengal: Predominating variables retained at the last step

Predictors	B	S.E	Beta XR	t	R2
Family size(X3)	-0.239	137.641	15.696	4.276	
Cultivated land (X6)	0.277	90.645	21.937	3.816	
Irrigation index(X9)	-0.257	7.791	-4.478	2.478	0.437
Expenditure index (Food & Health)(X11)	0.299	0.045	28.672	5.164	
Ownership of agricultural implements(X12)	-0.147	0.426	7.502	1.195	
Crop diversification index(X17)	0.216	4.687	11.976	2.282	
Media-social interaction index(X18)	0.163	13.527	11.475	2.822	
Distance matrix(X25)	0.119	279.818	7.221	2.130	

Revelation: Table 7 presents the stepwise regression analysis of the dependent variable, Income Index (Y₂) versus 26 independent variables of total 4 villages of Nadia District. It has been found that the following predominating variables *viz.* Family size(X₃), Cultivated land(X₆), Irrigation index(X₉), Expenditure index (Food & Health)(X₁₁), Ownership of agricultural implements(X₁₂), Crop diversification index(X₁₇), Media-social interaction index(X₁₈) and Distance matrix(X₂₅)have been retained at the last step of screening. The R² being 0.4370, it is to conclude that all the above four predominating variables have explained 43.70 percent variance embedded with the predicted variable, Income Index (Y₂).

Table 8: Stepwise regression analysis Haemoglobin level (Y₃) versus 26 independent variables of Total 4 villages, Nadia, West Bengal: Predominating variables retained at the last step

Predictors	B	S.E	BetaXR	t	R2
Family education (X4)	0.163	0.186	14.523	2.535	
Cropping intensity(X8)	-0.189	0.006	11.914	2.461	
Expenditure index (Education &Others)(X10)	-0.176	0.000	18.313	2.655	0.287
Expenditure index (Food & Health)(X11)	-0.206	0.000	27.431	3.059	
Technology socialization status(X13)	0.156	0.001	3.221	2.009	
Animal entrepreneurial index(X14)	-0.187	0.205	24.598	2.830	

Revelation: Table 8 presents the stepwise regression analysis as to extract some few causal variables out of 26 variables having substantive impact on Haemoglobin level (Y₃). 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 (X₄), Cropping intensity(X₈), Expenditure index (Education &Others)(X₁₀), Expenditure index (Food & Health)(X₁₁), Technology socialization status(X₁₃) and Animal entrepreneurial index(X₁₄).The conglomeration of these few variables selected through step down regression analysis has got 28.71% contribution to the variance in consequent variables, haemoglobin level and quite logically these variables are retaining immense, strategic importance of microlevel planning for estimating and influencing haemoglobin level (Y₃) of farm women.

Revelation: Table 9 presents the stepwise regression analysis of the dependent variable, Body Mass Index (Y₄) versus 26 independent variables of total 4 villages of Nadia District. It has been found that the following predominating variables *viz.* Age(X₁), Animal production consumption index(X₁₅), Media-social interaction index(X₁₈), and Capacity building index(X₂₁) have been retained at the last step of screening. The R² being 0.1324, it is to conclude that all the above four predominating variables have explained 13.24 percent variance embedded with the predicted variable, Body Mass Index (Y₄).

Table 9: Stepwise regression analysis Body Mass Index (Y₄) versus 26 independent variables of Total 4 villages, Nadia, West Bengal: Predominating variables retained at the last step

| Predictors	B	S.E	BetaXR	t	R2
Age(X1)	0.198	0.027	31.713	2.965	
Animal production consumption index(X15)	-0.170	0.082	15.441	2.544	0.132
Media-social interaction index(X18)	0.240	0.023	35.771	3.475	
Capacity building index(X21)	-0.194	0.188	17.076	2.906	

Table 10: Stepwise regression analysis Calorie intake (Y₅) versus 26 independent variables of Total 4 villages, Nadia, West Bengal: Predominating variables retained at the last step

Predictors	B	S.E	BetaXR	t	R2
Irrigation index(X9)	-0.287	1.406	7.121	2.647	
Expenditure index (Food & Health)(X11)	-0.224	0.009	26.310	3.461	0.196
Crop diversification index(X17)	0.287	0.941	-1.503	2.617	

Media-social interaction index(X18)	-0.291	2.646	41.884	4.443
Market interaction (X19)	0.208	13.829	26.188	3.209

Revelation: Table 10 presents the stepwise regression analysis as to extract some few causal variables out of 26 variables having substantive impact on Calorie Intake (Y_5). It have been found that the following variables retained at the last stage having substantive causal effect on livelihood of the farm women *viz.* Irrigation index(X_9), Expenditure index (Food & Health)(X_{11}), Crop diversification index(X_{17}), Media-social interaction index(X_{18}) and Market interaction(X_{19}).The conglomeration of these few variables selected through step down regression analysis has got 19.64% contribution to the variance in consequent variables, Calorie Intake and quite logically these variables are retaining immense, strategic importance of microlevel planning for estimating and influencing Calorie Intake (Y_5) of farm women.

Canonical Covariate: The Interaction between left side &right side variables
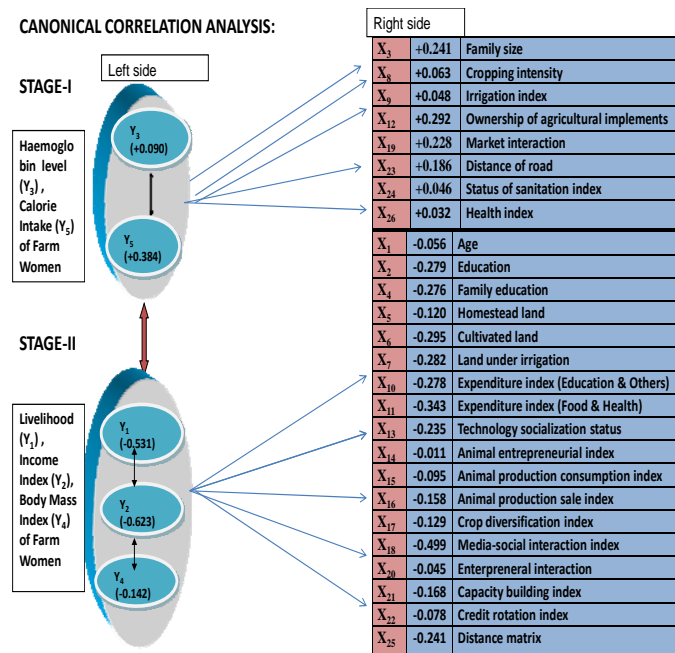
The canonical covariate analysis has been applied here to deviate the variables into two set of conglomerations i.e left side variables(Y_1-Y_5) and right side variables(X_1-X_{26}).

The above table as well as model shows that two dependent variables Haemoglobin level and calorie intake, one of the indicators of nutrition, have moved together.

So, the study reveals that Calorie Intake of a respondent has been operationally combined with haemoglobin level of the same respondents. So, scale of the haemogobin level one has

to be careful about the Carie intake property when this two consequent variables are in synergistic combinations, they are picking up the following causal variables for being mutually impacted viz. Family size (X_3), Cropping intensity(X_8), Irrigation index(X_9), Ownership of agricultural implements(X_{12}), Market interaction(X_{19}), Distance of road(X_{23}), Status of sanitation index(X_{24}), Health index(X_{26}).

For another instance, the dependent variables, Livelihood (Y_1), Income Index (Y_2), Body Mass Index (Y_4) have formed a conglomeration based on their homogeneity of interactions. It reveals that BMI helps better livelihood earning as well as income. It is especially true, when the farm women are to exert their, manual skills and proficiency to support the farm based livelihood vis –a- vis income.

This conglomeration has rightly been looked up the right side variables for being mutually impacted with Age(X_1), Education(X_2), Family education(X_4), Homestead land(X_5), Cultivated land(X_6), Land under irrigation(X_7), Expenditure index (Education &Others)(X_{10}), Expenditure index (Food & Health)(X_{11}), Technology socialization status(X_{13}), Animal entrepreneurial index(X_{14}), Animal production consumption index(X_{15}), Animal production sale index(X_{16}), Crop diversification index(X_{17}), Media-social interaction index(X_{18}), Enterpreneral interaction(X_{20}), Capacity building index(X_{21}), Credit rotation index(X_{22}) and Distance matrix(X_{25}).

3. CONCLUSION

Women are the important segment of nation and they are the backbone of Indian Agriculture. From the result it was found variables *viz.* Cultivated land, Irrigation index, Animal production consumption index, Animal production sale index and Media-social interaction index have substantive causal effect on livelihood of the farm women whereas variables *viz.* Family size, Cultivated land, Irrigation index, Expenditure index (Food & Health), Owner agricultural implements, Crop diversification index, Media-social interaction index and Distance matrix have substantive causal effect on income of the farm women. On the issues of health of farm women Family education, Cropping intensity, Expenditure index (Education &Others), Expenditure index (Food & Health), Technology socialization status and Animal entrepreneurial index have substantive effect on Haemoglobin and Age, Animal production consumption index, Media-social interaction index, and Capacity building index on Body Mass Index and Irrigation index, Expenditure index (Food & Health), Crop diversification index, Media-social interaction index and Market interaction also have on Calorie Intake. It is ultimately found from the study that Haemoglobin and calorie intake, one of the indicators of nutrition, have moved together whereas Livelihood, Income Index, Body Mass Index have formed a conglomeration based on their homogeneity of interactions. So on farming system if agro-ecological factors

can be given importance during policy making of farm women these health issues should be corrected.

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