Original Research Article

Perception of biophysical stresses confronted by the farm women: The socio-economic and ecological interpretation

ABSTRACT

The impact of the green revolution in India has got a dichotomy of both achievements as well as failure. The four pillars of green revolution have contributed to accentuating the productivity level from 55 MT to 120 MT, on the other hand, the fall out of green revolution started eliciting the pernicious effect by increasing heavy metal load in the food chain, drifting of manual labours off the field and the creation of chasms between marginal and rich farmers. The worst victim of these is farm women. A study was conducted with objectives to generate classified information on the occupational hazards of farm women. A study was carried out at Boinchigram village under Pandua Block in Hooghly district of West Bengal with one hundred twenty farm women as respondents. Family income, B.M.I., functional literacy, total calorie consumption used etc variables were taken for collecting data. Farm women are mainly suffering from fever, stomach problems, skin abnormalities, weakness, gynaecological problems, respiratory hazards, kidney malfunction, spinning head, increased heartbeat etc. Total calorie consumed per day and family income plays an important role in this. So, both preventive and curative measures should be taken immediately, otherwise, it will affect the future workforce of Agriculture.

KEYWORDS: Agriculture; Calorie; Farm women; Family income; Health; Occupational hazards.

Introduction

The impact of the green revolution in India has got a dichotomy of achievement as well as failure. The application of HYV seeds associated with agro-chemicals, fertilizers, farm machinery, irrigation water contributed to accentuating the productivity level from 55 MT to 120 MT and this magnum of biological magnification of agriculture has been termed as 'Green Revolution', on the other hand, the fall out of green revolution started eliciting the pernicious effect in the form of increased heavy metal load in the food chain, drifting of manual labours off the field and the creation of chasms between marginal and rich farmers.

The brut of chemicalization of agriculture has done a lot of menaces to both human and animal health, and beyond, to include microflora and fauna. The worst victim of this chemicalization in farm ecology is the farm women, while, they are contributing 70-80 per cent of the productive functions of agriculture. Acute exposure to organophosphates or carbamates resulting in poisoning can result in pulmonary symptoms. This can occur in applicators or field workers entering a field before the safe re-entry interval guidelines. A concern could be in ginseng production due to the canopy covering the plants and reported high use of pesticides. Excessive bronchial secretions and bronchoconstriction can cause acute respiratory distress, wheezing, chest pain, cough and hypoxia. Hemoptysis and pulmonary oedema may occur. The treatment consists of protecting the airway, adequate oxygenation, and administration of large doses of atropine to reverse the muscarinic effects of the pesticides. The cardiorespiratory arrest is the usual cause of death in acute poisoning (Reigert et al.1999). Musculoskeletal disorders and injuries are common in agriculture. A Colorado survey reported chronic back pain in approximately 25% of Colorado farmers and ranchers and almost 50% among dairy farmers (Xiang et al.1999). As many as 71% of swine producers report low back pain (Von Essen et al.1998). Musculoskeletal disorders and injuries are common in agriculture. Arthritis affecting the hips and knees was associated with dairy farming and driving tractors (May.1998) A survey of California farms reported overuse injuries including upper- and lower back pain (43%) and wrist pain (18%). Meyers *et al*. reported sprains and strains accounting for 49% of the injuries in California nurseries, with 46% of those injuries affecting the back. Ergonomics stressors in fruit harvesting include working with raised arms, repetitive forceful lifting, pinching, stooping, continual bending, and twisting, all while lifting excessive or awkward weights (Fulmer et al.2000). The evidence on the link between agriculture and nutrition has so far been tenuous. On the one hand, undernutrition rates are severe and more widespread among those involved in agriculture. This evidence is more pronounced when the households or regions with agricultural predominance are compared with non-agricultural regions (Dahiya et al.2015). Noise-induced hearing loss, an occupational problem resulting from noise exposure, is common in farming and affects 55% to 72% of the farming population (Beckett et al. 2000). Noise levels are often above the Occupational Safety and Health Administration (OSHA) permissible exposure levels in swine confinement buildings, tractor and combine operations, vacuum pump use, and in feed unloading areas (Holt et al. 1993). Adolescents working on farms have been shown to have significant hearing loss compared to a control group of adolescents (Chatterjee et al 2019). Noise-induced hearing loss significantly increases with age. The sound dampening of cabs on farm equipment decreases noise levels to 85 decibels or less, but there is continued

significant noise exposure from other sources in agricultural settings. Eighty-five decibels is the action level for OSHA-regulated facilities.

However, the level of agricultural performance or income has a strong and significant negative relationship with indices of undernutrition among adults and children; suggesting an association between improvement in agricultural productivity and reduction in undernutrition (Gulati et al.2012). The differences in the results of these two studies on the impact of agriculture on undernutrition are due to the nature of data and the measures used and hence the type of analysis. Headey et al. (2011) use a two-period data while Gulati et al. (2012) use a single cross-section so the former is a medium-run effect while the latter is a long-run effect since a single cross-section is being compared. In the former study, agricultural growth and other forms of agricultural performance indicators, including agricultural GDP per worker, are used, while in the latter study the agricultural GDP is taken as a proportion of the rural population. There is also a difference in the measure of undernutrition: Heady et al. (2011) consider the proportion of women with low BMI while Gulati et al. consider a normalised index of adult undernutrition that comprises of only thin women and (also) men. And it had found that the probability of low BMI among women is highest in cases where the husband's occupation is in the primary sector (Singh et *al*.2011). But the women who participate in agricultural work have lower average BMI compared to those who do not work. This has got again apocalyptic consequences on occupational performances relegating to their family life and peace as well. This has got again an apocalyptic consequence on occupational performances relegating to their family life and peace as well. Yet, a significant proportion of women do not enjoy a level of health that will enable them to achieve socially and economically productive lives (Dahiya and Viswanathan 2015). The most vulnerable of these women are those in the rural areas, who are often incapacitated by illness, disability and occupational hazards to mention a few. This reduces their efficiency for both agricultural and non-agricultural activities. High prevalence of epidemic and endemic diseases in most rural areas further aggravates poor health and misery (ILO 2000). In case of their gynaecological health, the WHO asserts that the Nigeria mortality rate is the second largest in the world caused by complications of pregnancy. Others occupational hazards of rural women are muscular fatigue, sunburn, migraines, and respiratory diseases and in a few cases stillbirth. Increased exposure to air pollution, organic dust from food processing, job overload and chemical hazards are also major risk factors in developing countries. It has seen that the exposure to poor working conditions has serious repercussions on pregnancy (ILO 2000). Besides, in a study of women farmers in Edo state, it has discovered that the most common occupational hazards of women engaged in crop production and other activities were heat-related sicknesses such as heat exhaustion and heatstroke. The prolonged exposure to cyanide fumes, fire and smoke during processing were considered responsible for respiratory diseases, migraine and heat exhaustion (Egharevba 1992). According to Wallace (1991), during the processing of food and cooking in smoke-filled rooms, women inhale up to 40 times the volume of suspended particles safe by the WHO. They also inhale air during bush burning and the fuel used in cooking. Besides, it was noted that carrying of heavy loads of firewood and raw farm produce can cause serious muscle and skeletal disorder such as chronic back pain, chest pain and miscarriages. In addition to the significant problem of fatal and nonfatal injuries associated with agriculture, there is a major problem with various illnesses associated with these activities(Mandol et al

2016). Based upon the review of National Health Interview Survey data from 1986 to 1990, it is reported that increased age-adjusted prevalence of the cardiovascular disease, arthritis, and amputations in farmers as compared to blue-collar workers (Brackbill et al.1994). Rautiainen et al. (2002) report work-related morbidity of 30.9 per 10,000 workers based upon the 1998 Bureau of Labour Statistics data. Skin conditions accounted for 56% of illnesses, followed by cumulative trauma (14%), respiratory diseases (13%) and all other diseases (17%). The prevalence of hearing loss increased only in those farmers over age 65. A recent review of deaths among farmers and pesticide applicators from the period 1986 to 1994 by Fleming et al. (2003) estimated greater age-adjusted relative risk in males, more heart disease, more motor vehicle accidents, and an overall elevation of cancer when compared to other occupational groups. Just as occurs with the reporting of injuries, the same issue of inadequate reporting of agricultural illness exists, and all recorded data is likely to be a significant underestimate.

The present research focuses its target on the farm women's' health vis-a-vis occupational hazards to elicit the facts what are factors under which they are relying on broken health and eroded motivation.

It is necessary also to identify the pathway of coercive and pernicious molecules in the agro-ecosystem and keeps engulfing the economic, ecological and biophysical health of farm women to generate classified information on biophysical problems of farm women, to estimate the level of biophysical problems of farm women in terms of a score of socio-economic and ecological factors, to estimate the interactive relationships between biophysical problems of farm women and the set of socio-economic and ecological variables and to generate micro-level policy implication based on the empirical study.

Methods

Participants

Participants in the survey were 120 farm women of the village Boinchigram. Some of them work on the family farm and some as hired agricultural labours.

Research locale and sampling

Bantika-boinchi Gram Panchayat of the Pandua block of Hooghly district in West Bengal was purposively selected for the study. The village namely Boinchigram was selected by random sampling. The area had been selected for the study because of-

(a) There is ample scope for collecting relevant data for the present study.

(b) Acquaintance with the local people as well as the local language.

(c) The concerned area was easily accessible to the researcher in terms of place of

Residence.

(d) The area was very easily accessible to the researcher in terms of transportation

(e) The closure familiarities of the student researcher with the area, people, officials and local dialects.

Purposive as well as simple random sampling techniques were adopted for the

study. For the selection of state, district, block and gram panchayat purposive sampling

techniques were adopted because the area was ideal for Occupational Health Management study, convenient for researcher and having the infrastructural facilities and in case of selection of villages and respondents simple random sampling technique was taken up.

Table.1. Sampling Technique and Sampling Design

Step	Items	Level	Approach
1	State	West Bengal	Purposive
2	District	Hooghly	Purposive
3	Block	Pandua	Purposive
4	Gram -Panchayat	Bantika- Boinchi	Purposive
5	Village	Boinchigram	Purposive
6	Respondents	120	Random
Total number of respondents: 120			

Pilot study

Before taking up actual fieldwork a pilot study was conducted to understand the

area, its people, institution, communication and extension system and the knowledge,

perception and attitude of the people towards the climate change concept. An outline of the

socio-economic background of the farm women of the concerned villages, their perception on health issues, natural resources, ecology, nutritional aspects etc helped in the construction of reformative working tools.

Preparation of interview schedule

Based on the findings of the pilot study a preliminary interview schedule was formed with the help of the literature and by the assistance of Chairman of Advisory Committee.

Pre-testing of Interview Schedule

Pretesting or preliminary testing is the process of an advance testing of the study design after the schedule/questionnaire has been prepared. The object of pretesting is to detect the discrepancies that have emerged and to remove them after necessary modification in the schedule. It also helps to identify whether the questions are logically organized, the replies could properly be recorded in the space provided for or there is any scope for further improvement. After conducting pretesting appropriate

changes and modification of the interview schedule have been made. The individuals who responded in pretesting have been excluded in the final sample selected for the study.

Techniques of field data collection

The respondents were personally interviewed from October 2016 to June 2017 and October 2017. The items were asked in Bengali version in a simple term so that the members could understand easily. The entries were done in the schedule by student investigator himself at the time of interview.

Variables and their empirical measurements

Several researchers pointed out that the behaviour of an individual has been understood more in-depth if one knows some variables, which comprised the constructed world of reality within which an individual received the stimuli and acts. The socio personal, agro-economic, socio-psychological and communication variables are such type of variables, which determine the behaviour of an individual. Appropriate operationalization and measurement of the variables help the researcher to land upon the accurate conclusion. Therefore, the selected variables for this study had been

operationalised and measured in the following manner.

Variables in the present study have been categorized into two main categories.

1) Independent variables.

2) Dependent variables.

Independent variables

The variables and empirical measurements.

Age (x1)**:** In all societies, age is one of the most important determinants of social status and social role of the individual. In the present study, the number of years rounded in the nearest whole number the respondent lived since birth at the time of the interview, was taken as a measure of the age of the respondent.

The number of children (x2): Farm women have to play both the role of farmworkers and the mother of their children. Children are the future who will hold the family baton. But the number of children matters, because, with the help of this data one can asses whether family planning aspect has adopted or not.

Number of farm work(x3): Total number of farm work is calculated for each farm women by summing up individual farm works.

W= (w1 + w2+w3+.....+wn)

Working hour per day (x4): This the total time a farm woman spends in her farm work. It has calculated in hours.

Incidence level of miscarriage(x5): As the farm women have to work hard in both the field and household and some of them have poor nutritional status. And the teenage marriage and then pregnancy is prevalent, the farm women sometimes face miscarriage problem. This is calculated by taking the number of times they have faced miscarriage up to the date of questioning to the respondents.

The number of animals reared (x6): This is the total number of animals reared by the farm household in their yard. This includes both the livestock and the poultry birds.

Height(x7): Height is measured in ft with the help of a measuring tape.

Weight(x8): Weight is measured in kg with the help of a weight machine.

BMI(x9): BMI is the abbreviated form of Body Mass Index. BMI is defined as the body mass divided by the square of body height. It is calculated by using the formula: $kg/(m^2 * 0.305)^2$, where 0.305 is used to convert ft^2 into m^2

BMI has categorized mainly in 5 groups viz. Very severely underweight (upto 15 kg/m2) , Severely underweight (15 -16 kg/m2) , Underweight (16 -18.5 kg/m2) , Normal (18.5 – 25 kg/m2) and overweight (25-30 kg/m2) .

Cereals consumed per day(x10): This the total amount of cereals consumed by the farm women per day. It is expressed in gram per day. Cereals are the staple food in this area.

Protein consumed per day(x11): This the total amount of protein consumed by the farm women per day. It is expressed in gram per day.

Fruits consumed per day(x12): This the total amount of fruits consumed by the farm women per day. It is expressed in gram per day.

Vegetables consumed per day(x13): This the total amount of vegetables consumed by the farm women per day. It is expressed in gram per day.

Total carbohydrate consumed per day (x14): This the total amount of carbohydrate consumed by the farm women per day. This calculated by summing up the total cereals and fruits consumed per day as these two are the main sources of carbohydrate to the respondents. It is expressed in gram per day.

Fat consumed per day(x15): This the total amount of fat consumed by the farm women per day. It is expressed in gram per day.

Breakfast time (a.m.) (x16): This is the time when the respondents have their breakfast. It is mainly taken in the morning i.e. a.m.

Lunchtime (p.m.) (x17): This is the time when the respondents take their breakfast. It is mainly taken in the afternoon i.e. p.m.

Dinner time (p.m.) (x18): This is the time when the respondents take their breakfast. It is mainly taken from the late evening to night i.e. p.m.

Calorie in carbohydrate per day (x19): Calorie means the energy required to maintain one's daily work. And the total calorie which is taken by the respondent per day

through carbohydrate is calculated by multiplying each gram of carbohydrate consumed by 4. It is expressed in kcal.

Calorie in protein per day(x20): Calorie means the energy required to maintain one's daily work. And the total calorie which is taken by the respondent per day through protein is calculated by multiplying each gram of protein consumed by 4. It is expressed in kcal.

Calorie in fat per day(x21): Calorie means the energy required to maintain one's daily work. And the total calorie which is taken by the respondent per day through fat is calculated by multiplying each gram of fat consumed by 9. It is expressed in kcal.

Total calorie per day(x22): This the total amount of calorie taken by a respondent per day. This is calculated as follows – Total calorie per day = (calorie in carbohydrate /day + calorie in protein /day +calorie in fat/day). It is expressed in kcal.

Size of holding (x23): This is the total size of land one family has. It is taken as the total size of both farm and homestead land but who have no agricultural land of their own i.e. they are sharecropper or landless agricultural labourers, the size of only homestead land has taken. This is taken in Katta. So, the size of the holding can depict the land status and main source of income of the respected farm family.

The family income per annum (x24): Family income per annum is calculated as the earnings of the family from primary and secondary sources in a year in rupees. Family income boosts the participatory attitude of the respondents and determines their family expenditure per year.

Per capita income per annum(x25): Per capita income of farm women per annum can revel her status in the society and her access to the total family income as well as resources. The gross income is constituted with the income from farming, the wage of agricultural labourers or part-time work as a maidservant. It is expressed in rupees. In the present study it is calculated as follows :

(Family income per annum / Family size) = Per capita income per annum

Family expenditure per annum(x26): Family expenditure per annum is the household expenses in different activities in a year. This is the output of family income.

Per capita expenditure per annum(x27): This is the outcome of the per capita annual income. It expresses the respondent's power in buying decisions within the family.

Functional literacy (x28): Functional literacy is a term was defined for UNESCO by Willam S. Gray (The Teaching of Reading and Writing, 1956,p.21) as the training of adults to meet independently the reading and writing demands placed on them. The judgements were given on a 5-point scale (1-very week, 2-week,3-normal, 4-strong, 5-very strong) by assessing mastery over the reading and writing capability and some other functional tasks.

Dependent Variable

Perceived physical problems (y): This is the physical problems faced by the individual farm woman till the date of interviewing. This has calculated by the following way –

Perceived physical problems = { (p1/ r1) + (p2/r2) + ... +(p n /r n) }/ Total no. of physical problems

Where , p = physical problem , r = respective rank in matrix ranking.

Results

Correlation Analysis

Table.2.Co-efficient of correlation (r): Perceived Physical Problem (y) vs. 28 Exogenous variables (x1-x28)

Serial Number	Variables	R value	Remarks ** : significant at 0.01 level *: significant at 0.05 level
1	Age (x1)	-0.0336	
2	No of children (x2)	-0.0606	
3	Number of farm work (x3)	-0.0355	
4	Working hour per day(x4)	0.0548	
5	Incidence level of miscarriage (x5)	0.0451	
6	Number of animals reared (x6)	-0.1534	
7	Height(ft) (x7)	0.3511	**
8	Weight(kg) (x8)	0.0947	
9	BMI (x9)	-0.2405	**
10	Cereals consumed per day (g)(x10)	0.1993	*
11	Protein consumed per day (g)(x11)	-0.0838	
12	Fruits taken per day (g) (x12)	0.196	*
13	Vegetables consumed per day (g) (x13)	0.0107	
14	Total carbohydrate consumed per day (g) (x14)	0.2255	**
15	Fat taken per day (g) (x15)	-0.0367	
16	Breakfast time in a.m. (x16)	-0.0083	
17	Lunch time in p.m. (x17)	-0.1888	*
18	Dinner time in p.m. (x18)	0.0919	

19	Calorie in carbohydrate per day (x19)	0.2255	**
20	Calorie in protein per day (x20)	-0.0838	
21	Calorie in fat per day (x21)	-0.0367	
22	Total calorie per day (x22)	0.1955	*
23	Size of holding in katta (x23)	0.0917	
24	Family income per annum (x24)	0.3807	**
25	Per capita income per annum (x25)	0.1508	
26	Family expenditure per annum (x26)	0.2636	**
27	Per capita expenditure per annum (x27)	-0.4614	**
28	Functional literacy (x28)	-0.5608	**

It has been found from table.2 that the variables Height (x7) , BMI (x9) ,Cereals consumed per day (x10) ,Fruits consumed per day (x12) , Total carbohydrate consumed (x14) , Lunch time (x17) ,Calorie in carbohydrate per day (x19) , Total calorie per day (x22) , Family income per annum (x24) , Family expenditure per annum (x26) , Per capita expenditure per annum (x27) and Functional literacy (x28) have recorded significant correlations with the dependent variable Perceived physical problem(y).

Regression Analysis

Table.3.Multiple Regression Analysis: Perceived physical problems (y) vs. 28 causal variables(x1-x28)

Serial Number	Variables	ß	ß*R	reg coef-B
1	Age (x1)	0.03	0.008	0.004
2	No of children (x2)	-0.078	-0.037	-0.134
3	Number of farm work (x3)	-0.137	-0.038	-0.173
4	working hour per day(x4)	-0.103	0.044	-0.214
5	No.of miscarriage (x5)	-0.033	0.012	-0.174
6	Number of animals reared (x6)	-0.076	-0.091	-0.064
7	Height(ft) (x7)	0.704	-1.932	4.815
8	Weight(kg) (x8)	-0.349	0.259	-0.173
9	BMI (x9)	0.537	1.011	0.392
10	cereals consumed per day(g)(x10)	3.076	-4.793	0.153
11	protein consumed per day(g) (x11)	-9.954	-6.522	-2.312
12	fruits consumed per day(g) (x12)	-4.915	7.532	-1.406
13	vegetables consumed per day(g) (x13)	-0.014	0.001	-0.001
14	Total carbohydrate consumed per day(g) (x14)	-16.605	29.276	-0.797
15	fat taken per day (g/day) (x15)	1.18	0.339	0.568
16	Breakfast time(a.m.) (x16)	0.005	0	0.014
17	lunch time(p.m.) (x17)	-0.204	-0.302	-0.525
18	dinner time(p.m.) (x18)	-0.023	0.017	-0.068
19	calorie in carbohydrate per day (kcal) (x19)	-2.718	4.793	-0.033
20	calorie in protein per day (kcal)(x20)	-0.023	-0.015	-0.001
21	calorie in fat per day (kcal) (x21)	-1.89	-0.543	-0.101
22	total calorie per day (kcal) (x22)	-48.274	73.777	-0.566
23	size of holding(katta) (x23)	-0.037	0.027	-0.005
24	family income(Rs.) per annum (x24)	0.977	-2.908	0
25	per capita income (Rs.) per annum (x25)	-0.3888	0.458	0
26	family expenditure annum (x26)	-0.782	1.612	0
27	per capita expenditure (Rs.) per annum (x27)	0.203	0.731	0

28	functional literacy(x28)	-0.619	-2.715	-0.001

Multiple R-sq = 46.50 F-value for R = -2.02 with 28 and 61 dfs

Table 3 presents the Multiple Regression Analysis wherein 28 causal variables have been regressed against the consequent variable Perceived physical problems (y). It has been found that the variable total calorie per day has made the highest contribution in the perceived health problems.

The R^2 value being 46.50 per cent, it is to infer that with the combination of these 28 causal variables, 46.50 per cent of variance embedded with consequent variable y has been explained. Inclusion of more number of variables or higher level of consistency in the variable selected could have contributed to a higher level of variance explained.

Table.4.Stepwise Regression Analysis: Perceived physical problems (y) vs. 6 causal variables(x3,x7,x17,x24,x26,x28)

Serial Number	variables	ß	ß*R	stru-R	reg coef-B	SE of B	T Val of B	VIF
1	Number of farm work (x3)	-0.182	1.387	-0.052	-0.229	0.104	2.197	1.063
2	Height(ft) (x7)	0.232	17.498	0.515	1.585	0.572	2.771	1.085
3	lunch time(p.m.) (x17)	-0.228	9.239	-0.277	-0.584	0.211	2.771	1.046
4	family income(Rs.) per annum (x24)	0.806	65.957	0.558	0	0	2.155	21.68
5	family expenditure per annum(x26)	-0.703	-39.856	0.387	0	0	2.089	17.569
6	functional literacy(x28)	-0.38	45.775	-0.822	0	0	3.184	2.204

Multiple R-sq = 13.01 F-value for R = 12.02 with 6 and 83 dfs

Table 4 presents the stepwise regression wherein 6 causal variables have been retained at the last step to imply their critical and effective contribution to the resultant behaviour of the variable y (Perceived physical problem). So, these 6 variables can be as important as in optimum resource allocation or strategic

importance in the management of health and nutritional issues related to farm women.

Whenever these 6 variables acted isochronously, they together can explain 13.01 per cent of the variance.

The solitary contribution of these six variables have (13.01 / 46.50 * 100) = 27.97 per cent .

Path Analysis

Table.5.Direct, Indirect and Residual relationship: Perceived physical problems (y) vs.28 Independent variables (x1-x28)

Variables	Total effect	Direct effect	Indirect effect	Highest Indirect effect
Age (x1)	-0.034	0.029	-0.063	0.7618 (x10)
No of children (x2)	-0.06	-0.0778	0.0178	-0.3558(x22)
Number of farm work (x3)	-0.035	-0.137	0.102	-0.6486(x10)
working hour per day (x4)	0.055	-0.102	0.157	-0.8449(x10)
Incidence level of miscarriage (x5)	0.045	-0.033	0.078	-0.2459(x10)
Number of animals reared (x6)	-0.153	-0.076	-0.077	-0.1765(x26)
Height(ft) (x7)	0.351	0.704	-0.353	0.7039(x7)
Weight(kg) (x8)	0.095	-0.344	0.439	-0.4584(x10)
BMI (x9)	-0.24	0.537	-0.777	-0.5452(x7)
cereals consumed per day(g)(x10)	0.199	4.279	-4.08	4.2794(x10)
protein consumed per day(g) (x11)	-0.083	0.007	-0.09	0.7314(x20)
Fruits consumed Per day(g)(x12)	0.196	0.822	-0.626	-1.1501(x22)
vegetables consumed per day(g) (x13)	0.01	-0.014	0.024	-0.2773(x10)
Total carbohydrate consumed per day(g) (x14)	0.225	0.006	0.219	4.2196(x22)
fat taken per day(g) (x15)	-0.037	0.202	-0.239	0.7946(x21)
Breakfast time(a.m.) (x16)	-0.008	0.004	-0.012	0.6224(x10)
lunch time(p.m.) (x17)	-0.188	-0.204	0.016	-0.5034(x10)
dinner time(p.m.) (x18)	0.091	-0.023	0.114	0.812(x10)

calorie in carbohydrate per day (kcal) (x19)	0.225	-0.167	0.392	4.2196(x10)
Calorie in protein per day (kcal)(x20)	-0.084	0.731	-0.815	0.7314(x20)
calorie in fat per day (kcal) (x21)	-0.037	0.795	-0.832	0.7946(x21)
Total calorie per day(kcal)(x22)	0.196	-4.285	4.481	-4.2855(x22)
size of holding(katta) (x23)	0.091	-0.037	0.128	-0.4062(x26)
Family income(Rs.) per annum (x24)	0.38	0.977	-0.597	0.977(x24)
Per capita income (Rs.) per annum (x25)	0.15	-0.3884	0.5384	0.4281(x24)
Family expenditure per annum (x26)	0.264	-0.782	1.046	0.9396(x24)
Per capita expenditure (Rs.) per annum (x27)	-0.461	0.202	-0.663	0.5535(x22)
Functional literacy(x28)	-0.56	-0.619	0.059	-0.6194(x28)

Table 5 presents the Path Analysis: the decomposition of r values into direct, indirect and residual effect. The variable total calorie consumption per day has recorded both the highest direct and indirect effect.

The variable x10 (cereals consumed per day) has exerted the highest indirect effect on y with the highest frequency.

The residual effect being 0.4669, it is to infer that even with the combination of 28 exogenous variables 46.69 per cent variance in y (Perceived physical problems) cannot be explained.

Canonical Discriminant Function Analysis with Critical Variables

Canonical discriminant function analysis was carried out to isolate the most critical contribution made by each independent variable on the dependent variable Perceived physical problems(y).

Discriminant function for y:

Table.6. Wilks' Lambda

Test of Functions(s)	Wikls' Lambda	Chi-square	df	Sig.
1	0.127	151.874	115	0.012

The table 6 shows that y at 1 through 5 response level has recorded the significant discriminatory function.

Table 7.: Eigenvalues

Function	Eigen value	% of Variance	Cumulative %	Canonical Correlation
1	1.263	45.2	45.2	0.747

The table 7 shows that y(1-5) have recorded eigenvalue 1.263.

Table . 8.Canonical Discriminant Function Coefficients for x1-x28 (Standardized co-efficients)

Variables	Canonical Discriminant Function (+ direction) Function 1	Variables	Canonical Discriminant Function (- direction)
X27	3.287	X25	-2.665
X1	1.098	X9	-1.359
X4	0.658	X26	-1.073
X24	0.656	X7	-0.791
X2	0.439	X13	-0.493
X16	0.354	X3	-0.183
X8	0.267	X12	-0.143
X10	0.245	X18	-0.143
X11	0.096	X6	-0.065
X5	0.029	X28	-0.014
X23	0.029		
X17	0.024		
X15	0.014		

Table .9.Canonical Discriminant Function Coefficients for y (Standardized co-efficients)

Variables (y)	Canonical Discriminant Function (+ direction)	Variables (y)	Canonical Discriminant Function (- direction)
6.00	2.260	5.00	-2.233
8.00	0.955	10.00	-0.681
7.00	0.153	9.00	-0.076

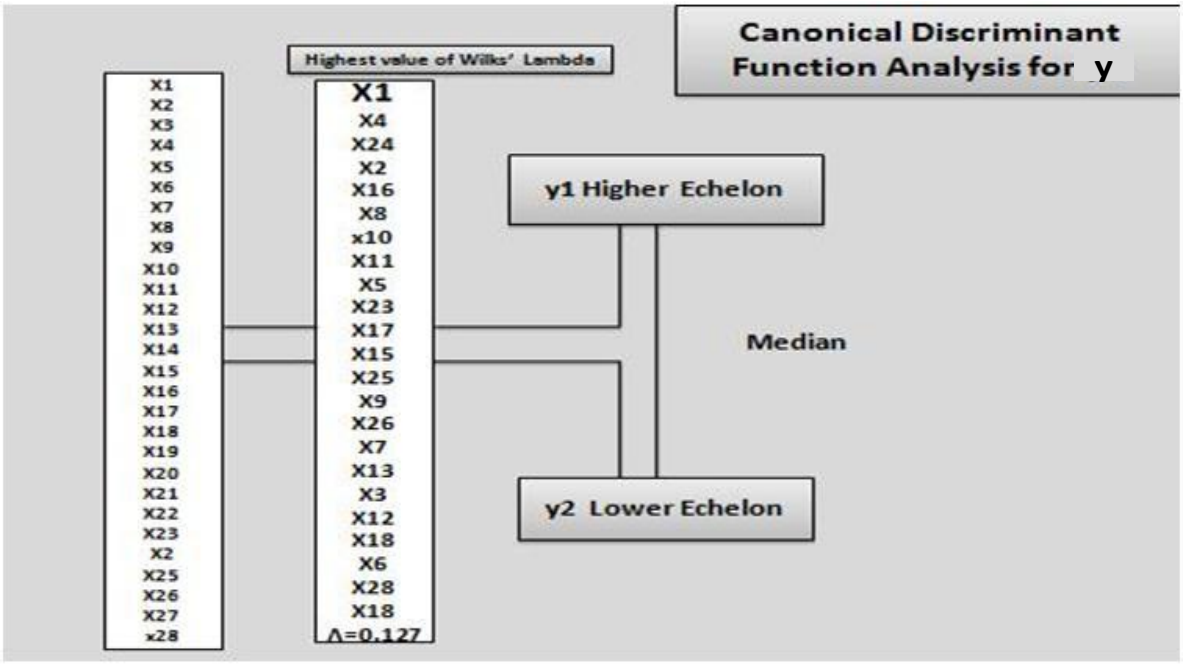

Figure.1.Canonical Discriminant Function Analysis for Psycho-social hazards(y)

From the figure.1 it has seen that the following variables have the ability to discriminate y : x1,x4,x24,x2,x16,x8,x10,x11,x5,x23,x17,x15,x25,x9,x26,x7,x13,x3,x12,x18,x6,x28,x18.

x1 (Age) has the highest ability .So, these have been the most critical variables **.**

Discussion

The co-efficient of correlations were computed to preliminarily asses the linear relationship between Psycho-social hazards (y) and 28 exogenous variables. The result from table 2 evinces that, perceived physical problems has been higher for those possessing lower BMI. So, lower BMI (Body Mass Index) or poorer health status has been reflected through higher physical problems. It has seen in Tamilnadu and Andhra Pradesh that probability of lower BMI is highest in rural working women. This may be due to their strenuous physical labour. In turn, energy is not replaced by proper dietary intake[2]. The variable, Lunchtime, revels that in case it is delayed, the physical problem has gone up. The variable, Per capita expenditure per annum, shows that for the respondents having less expenditure incurred after general maintenance including healthcare, the perceived physical problem logically has been up. Because their ability to take full advantage of health care programs is related to their economic status[1]. It is also discernible that functional literacy has recorded a significant but negative correlation to imply further that respondents having poorer functional literacy, are also possessing higher physical problems. The relationship between literacy and health has been the focus of much research and policy debate. In the US, for instance, people with low literacy competency were found to be 1.5 to 3 times more likely to have an adverse health outcome as compared with those who read at higher levels [4]. For the rest other variables viz. Height (x7), Calories

consumed per day (x10), fruits consumed per day (x12), total carbohydrate consumed per day (x14), Calorie in carbohydrate per day(x19), total calorie consumption per day (x22), Family income per annum (x24) and family expenditure per annum (x26) have predicted the perceived physical problems positively and proportionately to imply further that these variables have offered a direct but substantive prediction of the dependent variable.

It has delineated from table.3 through multiple regression analysis that to maintain metabolic functions and nutritional back-up, we need to take calorie-rich food, the deficiency of which may lead to different malfunctions of both body and mind. That's why the contribution of calorie consumed per day by the respondents have come up as one of the important determinants in elucidating perceived physical problems. Here, the contribution of the volume of food does not stand that important. The calorie gap observed might be mainly due to low-calorie density of their diets which are largely in the form of cereals, inferior grains and also due to the use of the inadequate amount of fats and oils in their diets. Recommended energy intake for moderate woman worker is 2225 kcal [10].

This is interesting to observe that when the number of effective variables has been downsized through stepwise regression from table.4 that the importance of causal variable family income per annum has been topped up. It can speak that the income of a family is the ultimate contributor to the level of health and nutritional performance beyond other concerns and issues. People with lower income have more restriction on access to medical treatments and are more uninsured or underinsured. They face greater financial constraints to afford hospital payments, costs of medicines and many other health care expenses[7].

From table .5, it has seen that the functional and operational contribution of total calorie consumption has been the highest on Perceived physical problems (y). So, this variable has earned the highest strategic importance in managing the drudgery of farm women. And cereal consumption per day has got tremendous importance. As, the staple food of those farm women are cereals and these give them energy, strength to sustain their daily lives.

From figure.1 it has seen that Age (x1) has the highest ability to discriminate because the perception and types of different physical problems among the farm women differ from age to age. It has seen that in young age there is mainly anaemia, weakness and gynaecological problems are common both among young and middle-aged farm women, besides middle-aged ones suffer from kidney problems, thyroid,gastro-intestinal problems, increased heartbeat, spinning head etc where old farm women mainly face eye problems, musculoskeletal disorders like back pain, knee pain, joint pain etc. Maternal mortality due to early marriage is the leading cause of death and disability among 15-19 years old young women in many developing countries and the years between puberty and menopause i.e. in case of middle-aged women health risks are mainly associated with sex and reproductive behaviour, which may result in mortality and disability. Inflicts on health status continues, so the health problems in adult women increases due to many non-communicable diseases e.g. cardiovascular diseases, cancers, injuries,

high blood pressure. Whereas women over age 60 suffer from heart diseases, stroke, chronic obstructive pulmonary disease and cancers. An important cause of disability in older women is vision loss or lower vision; it has found that every year, more than 2.5 million older women become blind [13].

Limitations and further research

These results are most important to keep in mind when policy formulation or planning on farm women's health issues, but there are need of more specifications because there are some limitations in the present study, like, a control group of respondents should have been an integral part of the research and helps to generate a comparative assessment of those 'experimental group'. And the size of the respondents could have been far bigger. Besides, gender comparison can be thereby matching the relational study and outcome with the male counterpart. Residual toxicity analysis also could have been better in terms of providing a real scenario of heavy metal contamination in the given farm ecology.

So, considering the nature and result obtained from the study, many research can be conducted in this direction. The present research thus leaves behind the following domains to be researched out in the future :

Health, both physical and mental, issues are becoming so dominant for any kind of productive economy and with no exception to agriculture.

Agricultural production and its management are to be organized in mostly open-air conditions. So, scorching heat, torrential rain and unhygienic environment are integral to agricultural management. So, future study will be more on the threats and mitigation over the health and nutritional issues.

A new term 'Health Ecology' is simmering up like anything wherein the gender issues will take a pivotal role.

Revisiting of disease epidemics due to climate change shall accentuate occupational hazards in agriculture to new complexity and unpredictability.

Farm Science Centres (Krishi Vigyan Kendra) should generate their data columns on farmers' health, nutritional aspects, indigenous knowledge including therapeutics in managing health and nutritional problems and community health clinics shall help to set up a new health paradigm in agriculture and rural development.

Conclusion

The productive function is generally a pre-estimation of ecological health, deliverables and resilience. The unwanted entry of promiscuous molecules into the ecological functions can add only a bizarre in the system behaviour of any agro-ecology. An exposure to perilous 'ecological components' has damaging effect and it may lead to a lethality at the worst. The other part of the observation suggests that farm women are driven to a merciless drudgery and cultural extortion called stereotypes with a broken heart and motivation eroded, how

could a farm woman sustain the family, the community and of course to her own life as well. So, a detailed study on the status, behaviour, character, propensity and intensity will go a long way in extracting the variables vis-a-vis factors, some of which need to be withdrawn while others have to be accentuated. So that a balanced eco-system can be in place to make the destiny of farmers, farm women and the ecosystem as a whole can be the 'Magnum opus' of modern farm sciences.

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Consent

As per international standard, respondents' written consent has been collected and preserved by the author(s).

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