ESSAYS ON INDIAN ECONOMIC PROBLEMS

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Edited by

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Preface

Economic development and enhancement of the well being of the poor masses was the laudable and over-arching objective of the Indian plans since the beginning. It was initially thought that the solution of the basic problems of the country and economic regeneration is not possible without proper planning even within the framework of international interdependence. In 1991, India has completed forty years of planning experiment in a democratic set up and reached the cross-roads. After many years of planning the economy has transformed a lot and grown in enormous proportions. Inspite of many changes the basic objectives remained unrealized. Hence the government thought to go someway along alternative roads. Every approach has its merits and shortcomings and as a consequence new problems are being created in every field.

Now another dimension has been added to the literature of economic development. It is felt that the economic processes of production, distribution and consumption are leading to the creation of shortages of resources and causing various types of pollution problems and increasing the social costs. The protection of environment has become an essential part of development and without which the process of development will be grossly undermined.

Economics of education and problems of gender have also gained prominence as a sub-discipline in economics and enormous research is also conducted in these areas-both in the political economy and neo-classical framework. Tourism as a sub-branch is also not that unimportant. The area of research and discussion is expanding and consequent investigations are moving in tandem.

The papers included in this volume do not focus a single theme and some have gone beyond the discipline of economics. The essays sought to analyze some crucial issues and the developmental problems we confront. The researchers based on their field level studies tried to explore the imperatives and implications of the changing economic scenario without any preconceived postulate or belief. The essays written by young researchers capture some elements of shifting dynamics in the areas of Agriculture, tourism, condition of children, education etc.

Pranab Kumar Chattopadhyay

1

Inclusive and Sustainable Development Strategy for Rural Areas: An Empirical Study for Tourism in Sikkim

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Abstract

Conventional concept of destination development undermined the sustainable issues and its orientation for developing rural Sikkim. Later on, the confusion was not the adoption of sustainable development philosophy but its correct implication and application. Alpine State Sikkim is primarily known as an exotic, idyllic, multi-ethnic Indian hill station since 1975 with its distinct bio-geographic and socio-cultural characteristics. Being one of the successful and mature alpine Indian States, development in Sikkim needs research oriented efforts. Most of the empirical researches for sustainable destination development are revolving around 'demand and supply' aspects of tourism which seeks equilibrium or a sustainable inter-linkage as a part of solution. The present article is also dealing with the opinion survey of tourists and local community through the future choice of tourism and its present development disparity. Results of the survey clearly indicated a direction to adopt such development strategy for infrastructure and amenities as may be led by demand but at the same time justified by community stakeholders. A survey was conducted for the primary data in three different places viz. Gangtok, Namchi and Mangan to assess tourism development of the State. Two sets of different questionnaires are prepared for guests and hosts. All the data are analyzed by Kendall's coefficient of concordance and Kruskal Wallis test.

JEL Classification: *E21, Q56, P41, P52*

Keywords: *Destination, national tourism organization (NTO), district tourism organization, competitive cooperation, human development index, unique selling proposition (USP), DLC, FMCG product, per capita expenditure, kruskal wallis test, kendall's coefficient of concordance*

Introduction

Sikkim is a small hilly state, bounded by vast stretches of Tibetan plateau in the North, the Chumbi Valley, and the kingdom Bhutan in the East, the kingdom of Nepal in the west and Darjeeling (West Bengal) in the south. The state lies between 27º04' 46" N and 28º 07' 48" N and 88º 00' 58" E and 88º 55' 25"E covering an area of 7096 sq. Km. Sikkim is famous for scenic valleys forest, snow clad mountains, magnificent Buddhist culture and heritage and peace-loving people. Though small, the environmental, social and cultural diversities are not so. Some scholars believe that the word Sikkim involves Nepalese dialect and it refers to a *'new place'* or the term has been derived from a Sanskrit word which means a *'mountain crest'*. The people of Sikkim have ethnic diversity. The Bhutias came from Tibet, the Lepchas were the aboriginal community, and the Nepalese came from Nepal. When Sikkim was an independent state and faced many invasions by its neighboring countries and the king took the help of the British India and, later, gifted some of its region including Darjeeling to the British Government. Now this 22nd Indian State (joined Indian Union in 1975) has Over 81% of the total geographical area under the administrative managerial control of the Ministry of Environment and Forest, Government of India. Over 45% of the total geographical area of the state is under tree cover and nearly 34% of the geographical area is set aside as protected area network in the form of national park and wildlife sanctuary. The basic statistics of flora and fauna are given here under.

Table 1: Flora and fauna of Sikkim

Mammals	144 species
Birds	550 species
Butterflies and Moths	650 species
Reptiles	33 species
Frogs	16 species
Orchids	550 species, 95 Genera
Rhododendrons	36 species, 45 varieties
Flowering Plants	Over 4000 species
Ferns and Allies	300 species
Conifers	9 species
Medicinal plants	Not enumerated

Source: Economic Survey 2006-07, Govt. of Sikkim

The maximum summer temperature 28^{O}C and minimum winter temperature is 0^{O}C. Sikkim has a variety of mineral resources including coal, limestone, iron ore, graphite, pyrite etc. The temperature in the bottom of the valleys (up to 600 meters)

situated at lower elevations, particularly during summers, are similar to the monsoon type of climate. The temperature starts falling between 600 meters and 2000 metres above sea level and the place enjoys cool temperature climatic conditions and further up (2000 meters to 3000 metres) it is cold temperate climate. Arctic type of climate is found above 5000 meters.

Table 2: Sikkim at a glance

Area	7096 sq.km.
Population (2001 census)	540493
Growth rate (1991-2001)	32.98%
Density per square km.	76
Sex ratio (female per 1000 male)	875
Literacy rate Male Female	69.68% 76.73% 61.46%
Capital	Gangtok
No. of districts	4
Legislature	Unicameral
Principal languages	Nepali, Lepcha, Limbu
Assembly seats	32
Lok Sabha seat	1
Rajya Sabha seat	1
Judiciary(name and location)	High court of Sikkim at Gangtok
State day	May 16

Source: Economic Survey 2006-07, Govt. of Sikkim

Sikkim is ecologically a fragile region. The state has the responsibility to conserve its rich biological diversity that includes coexistence and protection of over *5000 species of angiosperm (one third of the total national angiosperms)*. Again this place has multi-ethnic communities. So the need for ecological, cultural and social diversities is not only essential but imperative as well.

Review of Literature

The ‘destination’, an agglomeration of actors seen from the supply side, exists in a kind of strategically dependent place having inherent or built resources. This definition

can be described as a pragmatic demarcation which is analogue to marketing practice. The commercial actors (the industry's) empirical documented co-operation/network describes another space which is connected to the production chain and which differs from firm to firm. The authoritative actors (such as NTOs, DTOs etc.) acting in space inside administrative boundaries perceive tourism with almost all stakeholders and strive to synchronize the interest of all involved in the process. The business-inspired conventional authors are convinced of the importance of the 'destination' as a key factor in tourism, a place containing actors who produce together a total product which is the answer to the destination imagery and a total experience. They convince that a destination is a variety of products satisfying the tourists demand and is identical to the tourists understanding of the place they are visiting. The authors from economics mention three central notions: attractions, facilities, and services. But not all of them differentiate between them; some take the destination as an attraction, where an attraction is defined as an agglomeration of experiences, facilities and services. Non-commercial attractions such as landscapes, townscapes, beaches etc. are mentioned, but not seriously analyzed. These authors in the field of tourism accept co-operation as a mean of production, but most of them do not analyze it in any depth. Marketing authors emphasized the collaborative approach and strategic linkages of tourism principals and how a "competitive cooperation" distinctively playing an important role in destination as a whole. The sociological literature is talking about 'images' which are experienced by interaction with the tourist. Such images, for instance, are landscapes and townscapes as a part of the cultural heritage. Facilities and services are noticed, but not analyzed as such. The cited empirical findings point out the same descriptions of content depending on whom has been interviewed – the tourists, the commercial actors or the formal organizations. Moreover, Swarbrooke (2001) gave an outstanding and pointed summary about the traditionalists understanding of the 'destination'. But it is not evident what geographical status this 'destination' has - if any at all. Perhaps Neil Leiper (2000) in some way means the same when sarcastically criticizes the 'destination' as "raison d'être" of tourism. The sociological authors, on the other hand, are not very interested in the 'destination'. They deal with tourists and their performances, their social acting in time and space, and argue that every tourist by acting socially creates his own tourism place or space.

But place and space are not identical, following Haldrup's interpretation of de Certeau (1988): Following Michel de Certeau he draws a line between place and space in relation to tourism practices. Whereas "places" according to de Certeau are the stable, strategically ordered homogenous configurations (the region as it is represented symbolically through narratives, marketing material, art works etc. and embodied materially in architecture, signs and markers, and the physical lay-out) he defines "space" as "practiced place" … i.e. the spaces produced by agents employing a variety of tactics that rest on an ongoing and contingent process of reconstruction of practice and the mobilization of different degrees of reflexivity. The empirical work showed that the activities of the industry, the authorities and the tourists were verified with the general theories' on 'destinations' i.e. most congruence exists between the tourists'

behavior and the sociologists' description of the tourists' social practice. On the other hand, tourism places and tourism spaces exist, and the tourists, the industry and the governments/ authorities act in concrete spatial contexts. An interesting note is that neither the economic writers, nor the sociological writers and nor the empirical findings show any special interest in describing the 'destination' or the tourist place/space by physical geographical borders. *The 'destination' is a narrative created by marketing: it is a place structured by processes and experienced by social actions, and it 'exists' on various geographical levels, but it is never a place with clear boundaries.* But destination marketing is different in that here the product formulation and the product itself is multiple and jointly contributing to the experience. Consumption place is also different from the residence of the customers and the derived demand should not exceed the actual demand though both of them need to be properly integrated. Many tourism products can target different group of customers at a time or during different seasons e.g. Sikkim can target mass and non mass tourists both or differentiate customer segments with the changes in season. De-marketing strategy could also be seen in many places to maintain the carrying capacity level (as the supply is lumpy) and quality of the product.

Some eminent tourism scholars have brought in background knowledge from conventional disciplines to define communities. Here, the meaning of community has been defined and oriented to some geographical, social and anthropological perspectives. Destination community refers to a heterogeneous group of people who share residence in the same geographic area and access a set of local natural resources. The degree of social cohesion and differentiation, strength of common beliefs and institutions, cultural diversity and other factors vary widely within and among communities. So, the term community conjures up a mental picture of a defined set of people living together, symbiotically bound to each other and their habitat, thereby rendering themselves a distinct collective personality. Murdock (1955) suggested that any social group, existing in a territory and meeting all its problems of survival and continuity, should be considered a community.

Traditionally, the tourism industry is based on a network of small and medium sized tourism enterprises, which provide all types of tourism products and services, while enabling closer interaction between the host population and visitors, as well as facilitating a rapid infusion of tourism spending into the local economy (Cooper and Buhalis, 1992). McIntosh (1977, 151) goes further steps (than Gunn), encompassing his goals for tourism development within a community framework. Peter Murphy, Middleton et. al. advocated community participation and consultation that adds a new dimension in planning and successful implementation of tourism for the majority. Consideration of perception, opinion and attitude of all stakeholders including the local people ensure sustainable tourism development anywhere in the world. McIntosh specified the following goals essentially revolving around the benefits to the local communities. These are (i) to maintain the traditional pattern of agriculture, (ii) to encourage those forms of tourism with the greatest local benefit, (iii) to create jobs at most of the existing settlements within the region, and (iv) to safeguard the identity of

local communities by seeking to retain and develop cultural heritage. Sikkim will have a competitive advantage if the local communities are involved from planning and administration to its actual implementation.

Purpose of the study, Methodology and Hypothesis

The basic purpose of the study is to assess the traditionally accepted guest-host relationship with sustainable destination development and management perspective. The relationship between guest and host has several new innovative implications in destination development and its management. Here, we find a new approach of destination development with an understanding of sociological relationship contributing to the introduction and management of human resources involved in tourism as local community, industry personnel and tourists. It will also introduce an initiative to adopt a sustainable development of all destination stakeholders. More specifically, the main objective of the study is to:

- Identify and measure the relationship between the intensity of tourists and adverse and positive socio-cultural and economic impacts of tourism equally.

This study was conducted by using self-administered questionnaires with the consent from the Hotel managers beforehand. Pilot testing was conducted using a small convenience sample of 35 respondents from various hotels in Sikkim. The respondents were informed that their participation was on a voluntary basis and all information provided would be kept private and confidential. Questionnaires were distributed only to those who agreed to participate in the study. The researcher then briefly explained the nature and requirement of the survey before the respondent filled up the questionnaire. For collecting the data from the primary sources, two sets of structured questionnaire made both for tourists and community members belonging to gangtok, Namchi, Mangan, and Pelling. Apart from that observation, schedules and interview methods are followed for the above said purpose. A total of 475 customers were interviewed, and the overall response rate was 42.32% (201 completed, usable questionnaires). A total of 480 Community members of the different areas of Sikkim were contacted and the overall response rate was 20.41% (98 completed, usable questionnaires)

Besides, Economic Review of Sikkim (2006-2007), Human Development Report of Sikkim (2001), Report of the TATA Economic Consultancy on Tourism, various articles, journals etc. have been considered as secondary data source.

H0: There is no relationship between the intensity of tourists (or its number of arrivals) and its consequent tourism impacts.

Study of Local Community and Tourists

Sikkim has a total population of 610577 (according to the 2011 Census) of which 47% are female. The social compositions (ethnical group) of Sikkim are - Lepcha (19%), Bhutia (16%) and Nepali (56%) which constitutes a majority of the population.

The Measurement of Human Resource has put Sikkim among the top of all the small States of India, Which has brought home a National recognition Award recently on 6th August 2004, in a conclave of Chief Minister held at New Delhi. In the conclave, the results of evaluation of the performance of all the states, union territories was done and then ranking based on their performance in the various categories like prosperity and budget, healthcare, law and order, investment, environment, agriculture, infrastructure, consumer market and education on 250 variables of performance were announced.

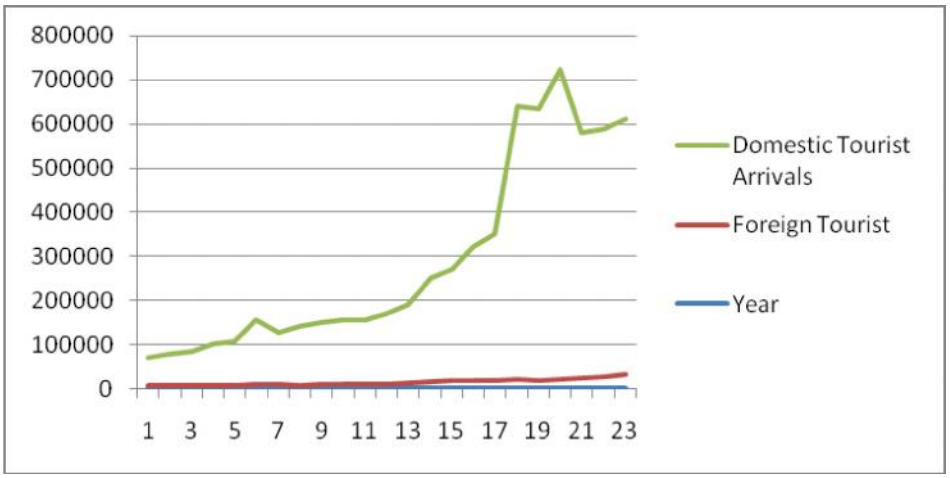
In the category of small states, Sikkim was among the first three best performing states in the field of law and order, health and investment scenario while, begged the first rank in the field of education. The annual rank of the state in the category of smaller states is fifth.

Sikkim has recorded several significant gains in the human development indicators after merging with India as a 22nd state of Indian union. Under the measurement of HDI (Human Development Index), women of Sikkim have been given special place in GDI (Gender Development Index), GEM (Gender Empowerment Measures) calculations. Women enjoy many freedoms and have recorded significant gains in the race of overall human development. However, like in many parts of the world, they still live in an unequal world. In Sikkim, women enjoy relatively greater freedom than in other parts of the country. Communities, cultures, religions and customs of different hues intermingle freely here in Sikkim, to constitute a homogeneous blend. Hindu temples coexist with Buddhist monasteries and there are even a few Christian churches, Muslim mosques and Sikh Gurudwaras. The predominant communities are the Lepchas, Bhutias and Nepalese, Women attributes high Position in the society. In the urban areas Marwaries, Biharis, Bengalis, South Indians, and Punjabis have also settled who are mostly engaged in business and government services. Cultural and economic forces boosted by the information technology and development activities are reshaping the way of life of the citizen of Sikkim. The people of Sikkim have however proved to be resilient, accepting the benefits of progress while retaining their ethnic identity.

Data Analysis and Discussion

After becoming 25th state of the Union Government of India in the year 1975 the rapid development activities ushered in a new era of tourism in Sikkim. Increased accessibility by roadways and air transport, rapid socio-economic development, competitive advantage both from the side of the destination and geographical proximity to tourist generating states contributed to the development of tourism in Sikkim. Recognizing the increased tourist arrivals, accommodation units were set up in Gangtok and a few towns mostly by outsiders without proper land use planning and architectural design.

Figure 1: Domestic and Foreign Tourist Arrivals in Sikkim

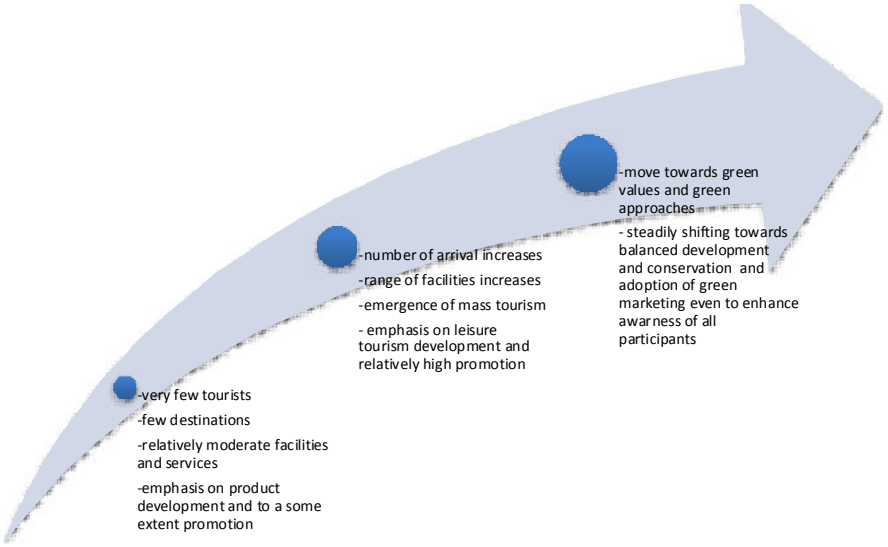


Source: Sikkim Tourism Development Corporation, 2014

Arrival statistics of domestic and international tourists for last 23 years (since 1991) has clearly indicated the dominant position of domestic tourism compared to its foreign tourist arrivals. The consequent effects of earthquake for two consecutive years of 2011 and 2012 resulted in a down fall and even a negative growth in overall arrivals in Sikkim.

Following the case studies of Sikkim over the years it has been noticed that all destinations at each life cycle stage are characterized with specified attributes. The most succinct views related to destination development have been given here under.

Figure 2: Changes in destination development approaches of Sikkim since 1975

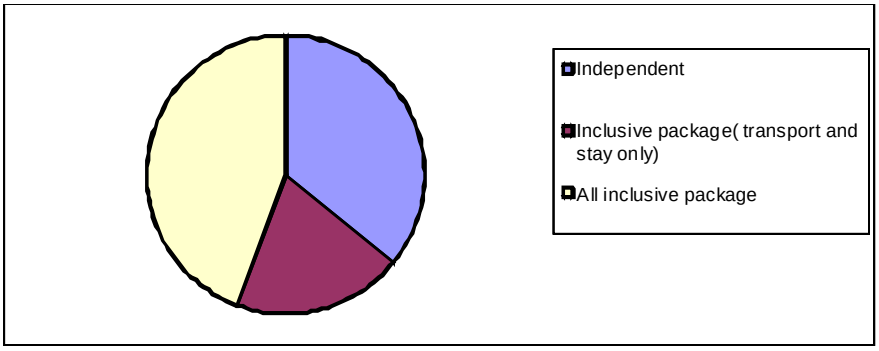


Development and adoption of marketing approach extensively include a '*demand – supply equilibrium'* and as such takes into account tourism system. Destination marketing is unlike a marketing of FMCG products as it considers and more towards services. Again, in many cases the adoption and control is not fully devolved upon corporate sectors. As a service marketing it includes customer relationship management, internal marketing (with respect to a destination where all stakeholders are part of the product and contribute to the image and identity), increased importance of strategic alliances/ linkage etc. Destination marketing should be a part of destination management but in Indian destinations the concept is not in vogue and very often management and marketing are wrongly conglomerated with each other. There are very few destinations well managed by scientific research and background analysis. The country including Sikkim has poor quality database and only in few cases the available data have been scientifically analyzed and interpreted as majority of destination planners and government officials are not from tourism background.

So, an understanding of the demand for Sikkim as a destination and the capacity levels (physical, biological, social, psychological, financial) largely contribute to the overall marketing strategy. The government of Sikkim is one of the very few Indian states trying to optimize benefits from tourism for their local people. The recently adopted policy to position the state as an Ultimate Ecotourism Destination was really a committed responsibility towards sustainable development. Next to this is rural tourism and adventure tourism. *Almost all these tourism will contribute to the alternative tourism development in the state and the changes in types and forms of tourism will automatically have an impact on the activities of the tourists, duration of stay, the number of tourist arrivals and the tourism industry as a whole.* So a proactive environment friendly approach has already been adopted in the marketing mix and Unique Selling Proposition (USP) of Sikkim though there are many things remaining. The major task for the government is how to coordinate and control interest of all participants and infuse the idea of sustainable practices in the state. The priority area is really confusing as there is a traditional clash between development and conservation. The destination marketing should not only increase the arrival of tourists but also be proactive in selecting target groups and introduce sustainable practices including mass awareness for environmental conservation.

The majority of the income groups of domestic tourists are found to be in the slab of ₹ 30000 above. The second important feature is the second largest number of respondents immediately preceding the earlier slab i.e. 20,001-30,000. It is also found that the segment of lower income group is interested to travel the traditionally known leisure tourist destination Sikkim. The majority of the income level of foreign tourists are found to be above ₹ 1,00000 and it is followed by 80,001-1,00000 and 60,001-80,000 respectively. Sikkim receives a considerable number of independent tourists even from the domestic segments and there is a new trend to avail of *partial inclusive package* of transportation and accommodation units only. Independent tourists don't book any facility or service in the destination a priori and can avail of all immediately after reach.

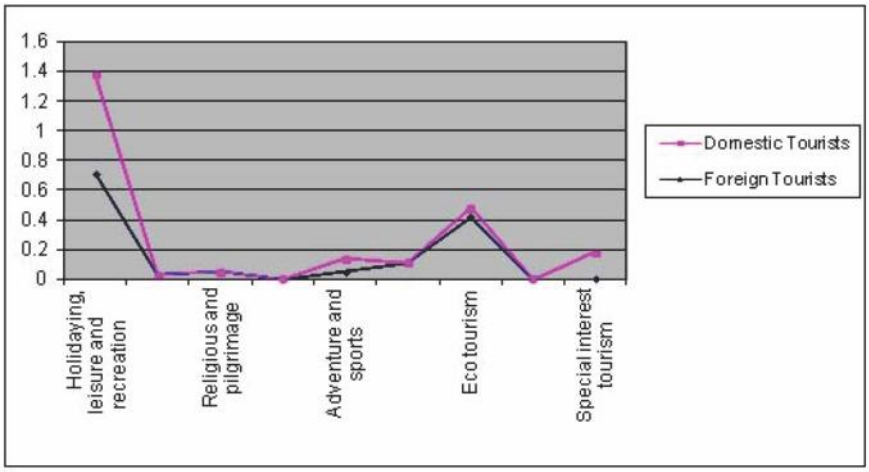
Figure 3 : Types of Tour in Sikkim



Source: Field Survey, 20013-2014

Majority of tourists travel Sikkim in group and avail of all inclusive tour packages till date. The above diagram expresses the further scope for measuring the involvement of tourism industry with recent changes. Sikkim is found to the destination of service holders who are associated either in public or private sectors in India or abroad. Second important occupational group is the businessmen who are self employed and traveling either with their family or for the core business purpose. Third group is either students or scholars or house wives.

Figure 4: Purpose of Visit in Sikkim by Domestic and Foreign Tourists



Source: Field Survey, 20013-2014

A general influx in either case of domestic and international tourists is found in case of ecotourism and to some extent adventure tourism. So, there is an immense growth potentiality for ecotourism, adventure tourism and special interest tourism.

The market for special interest tourists has been growing more with the foreign counterparts. There is also a small influx in pilgrimage and Buddhist cultural affiliation. Through their present demographic characteristics and product choice, significant future requirements for infrastructure and superstructure are interpreted.

More than ninety per cent of the total number of tourists visiting Sikkim is domestic and rests are international. So, domestic tourists are pre-dominating the guest-host relationship. Foreign tourists, though small in size, are distinctive, identifiable and creating high socio-cultural and economic impacts as their level of involvement was found to be high. Keeping in view the proportion of arrivals of either type of tourists, questionnaires for tourists was surveyed specifically to know why they travel.

Table 3: Mean of Ranks* Showing the Purposes of Travel

Factor	All tourists		Domestic Tourists		Foreign Tourists	
	Mean of Ranks	Ranks	Mean of Ranks	Ranks	Mean of Ranks	Ranks
Holidaying, leisure and recreation	1.64	1	1.49	1	3.09	2
Social (visiting friends and relatives, marriage etc.)	5.89	8	5.71	7	7.28	8
Religious and pilgrimage	5.82	7	5.79	8	5.84	6
Adventure and sports	4.17	4	4.35	4	3.13	3
Providing holiday opportunity to spouse/ family/attendant	4.11	3	3.76	2	6.30	7
Eco tourism	3.89	2	4.06	3	3.19	4
Rural tourism	5.47	6	5.54	6	4.28	5
Special interest	5	5	5.29	5	2.89	1

* Mean of Ranks derived from Kendall's Coefficient of Concordance

The mean of ranks ultimately exhibits the ranks to be considered to know why people travel. Each purpose separately contributes as the type and form of tourism contribute largely to destination development and management strategy. Domestic tourists are largely responsible for domestically institutionalized forms of tourism development typically oriented to cheap tourist products, more price sensitivity, tourist arrivals along a very few tourist circuits resulting in deterioration of environment and ecology. Again,

from all ranks, it is expected that foreign tourists will induce high impact tourism with more involvement that may result in serious cultural and ecological damage and less amount of economic benefits with a handful of tourists. So, there is an ambiguity as to how to increase per capita expenditure without ecological deterioration. From the supply side aspects, initiatives and allotment of infrastructure and superstructure development is also heavily influenced by the above mean ranks.

Another primary data survey, specifically to verify hosts' opinion, brought to light a new orientation of supply side aspects of tourism. Households in Sikkim are asked to explain their agreement with respect to the thirty one most important interrelated and interdependent industry and/or impact variables with the appropriate scale (strongly disagree=1, strongly agree=5). When households in Sikkim are asked to explain their agreement with respect to these thirty one most important interrelated and interdependent statements of tourism industry/ impact variables with the appropriate scale (strongly disagree=1, strongly agree=5), a typical orientation of destination specific and prevalent variables came to light. The above thirty one variables are taken into note by considering the most noticeable adverse impact variables of tourism in most of the Indian alpine regions. More specifically, hosts in Gangtok are agreed or strongly agreed upon most of the industry and/or impact variables while hosts in Namchi and Mangan considered less number of industry and/or impact variables as tourism, so far, is less intensive compared to Gangtok. The most prevalent Kruskal Wallis rank test has exhibited .002 (asymp. Sig) for Gangtok while the same is 0.00 for all three destinations. Gangtok is having an institutionalized form of tourism development with high tourist intensity, retention and inadequate or inappropriate or absence of tourism legislation (Butler Classical Model for different types of tourism legislation). This institutionalized form of tourism has an influence on the tourist satisfaction and sustainability factors.

Another non-parametric Kruskal Wallies rank test for fifteen most important and noticeable impact variables with five point scale indicating adverse effects of tourism, have exhibited the same indication of regional disparity i.e. destination specific importance of all such variables. A total ninety eight questionnaires are surveyed in three different places of Gangtok, Mangan and Namchi. The rank indicated a very significant result of .000 for all three places while for Gangtok, Namchi and Mangan the results were .981, .146 and .726 respectively. The results are given here under.

A distinct and surprising result is that more the mass tourists of Gangtok are satisfied less the local community is likely to be happy. This event contradicts the conventional belief of interrelated and interdependent satisfaction between guest and host or may be the earlier stage where the interests of all the parties are protected. Though the information of the number of tourists visiting Sikkim is available, yet the concept of collecting region specific information is not in vogue. Again, the supply side aspects of each destination is different and not to be confused by considering apparently similar attraction features and infrastructural requirements.

Table 4: Results of Industry and/or Impact Variables Showing Regional Disparity

Sikkim	**Gangtok**	**Namchi**	**Mangan**
Test Statistics	Test Statistics	Test Statistics	Test Statistics
VAR00001	VAR00001	VAR00001	VAR00001
Chi-Square 512.818	Chi-Square 22.158	Chi-Square 37.005	Chi-Square 24.050
df 98	df 38	df 29	df 29
Asymp. Sig. .000	Asymp. Sig. .981	Asymp. Sig. .146	Asymp. Sig. .726
a Kruskal Wallis Test	a Kruskal Wallis Test	a Kruskal Wallis Test	a Kruskal Wallis Test
b Grouping Variable: VAR00002	b Grouping Variable: VAR00002	b Grouping Variable: VAR00002	b Grouping Variable: VAR00002

It implies relatively a high degree of impacts (favorable and unfavorable) and their increasing awareness among the local people. It also implies a variation of opinion influenced by a region and its distinct economic, environmental and socio-cultural issues.

Conclusion and Suggestions

The main constrain for achieving sustainable and inclusive economic and socio-cultural growth through tourism is a conventional regional disparity evident in four districts of Sikkim. This regional disparity is oriented to the demand and supply of tourists and tourism industries respectively. People of East Sikkim including Gangtak are more aware of this disparity than the other districts. More a destination is institutionally developed more the proponents of the industries are aware of the regional/ declinational disparity. Another noticeable trend is reactive environmental awareness as people of less institutionally developed districts/regions advocates more conventional tourism development than the already–developed tourism regions/districts. The extensive and conventional developmental program to accelerate viable economic growth may cause serious environmental and socio-cultural damage and loss. The inherent tourism development potentiality must be radiated or expanded with an inclusive and sustainable orientation to mitigate resultant unsustainable consequences.

More specifically, following are the issues to be considered as a part of sustainable destination development with an emphasis on economic and socio-cultural relationship between guest and host in Sikkim.

- Development of similar attraction features keeping in mind the channelizing of similar tourist traffic.
- New areas under development should incorporate sustainable and community oriented types and forms of tourism with 'low volume high profit' intention to introduce a big-push to break less profitable domestic mass tourism with high exploitation of ecology and socio-cultural environment.
- Advertisement efforts should penetrate all such destinations.
- Zoning and architectural design, development of new circuits, possible adventure/alternative/special interest tourism potentialities should be a part of proactive destination development program (DDP).
- More financial incentives and less fiscal control to be the basis of drawing the interest of investors with an emphasis of local entrepreneurship development.

A holistic orientation of tourism among all authorities, inclusion of all other government and non-governmental agencies, development of supply linkage, changes in demand orientation are required. It is also the recommendation for destination specific development directed to the optimization of achieving equilibrium of interest for all stakeholders in which local people are predominating.

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2

Seed Inoculation: A Tool for Enhancing Pulse Production by the Resource-Poor Farmers of West Bengal

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Abstract

There is a growing demand of pulses to meet the food and nutritional requirement of burgeoning population in India. Though the state of West Bengal is self-sufficient in the production of rice, potato and vegetables, there are still deficits in the production of pulses, oilseeds and wheat. As agricultural land is becoming very much scarce day-by-day, vertical development in productivity is a matter of concern rather than horizontal expansion. At the time of rising food prices, increasing population and growing concern over food and nutritional security, farmers need to enhance levels of food production, especially of pulses, from the limited area through agricultural biotechnology, seed inoculation with proper biofertilizers and intensive but appropriate agricultural practices. Biofertilizer is a low-cost viable input which plays a significant role in enhancing pulse crop productivity by the resource-poor farmers. This is also important from the view point of environmental safety. Different aspects about various seed inoculating organisms and their usage have been dealt in the present paper.

Keywords: *Biofertilizer, pulses, seed inoculation, productivity, soil fertility*

Introduction

Human civilization is continuously being threatened by two serious issues, namely, food insecurity and climate change. Now the mankind has two primary demands - availability of sufficient food to survive and improving the quality of life. Both the problems and the demand are directly or indirectly related to soil fertility and productivity of pulses. The worldwide steady increase of population is continuously exerting pressure on the limited natural resource base, making it difficult to produce more food and fibre. As agricultural productive land is becoming very much scarce day-by-day, vertical

development in productivity is a matter of concern instead of horizontal expansion. At times of rising food prices, escalating population and growing concern over global food security, farmers need to enhance levels of food production from the limited cultivable area through the development of agricultural biotechnology, seed inoculation with proper bio-organisms and intensive but appropriate agricultural practices. Although vertical development of agriculture requires extensive use of chemical fertilizers, it results in numerous problems like nutrient imbalance, micronutrient deficiency, deterioration of soil health and stagnating crop yields. Under this situation, it calls for renewable and sustainable alternatives. The new approach for farming, often referred to as 'sustainable agriculture", advocates the use of renewable inputs like biofertilizers, green manures, vermicompost, etc., of which biofertilizer use is especially important from the view points of environmentally safe technology and providing some sort of fertilizers to the resource-poor and marginal farmers. Seed inoculation with biofertilizer is a low-cost input which plays a significant role in raising pulse productivity and enhancing nutrient availability to the crop plants.

Biofertilizers or microbial inoculants can be generally defined as any preparations containing live or latent cells of efficient strains of nitrogen fixing and phosphate solubilizing microorganisms used for the treatment of seeds or soil. Seed inoculation with biofertilizers which are the preparations of a group/mixture of soil and/or root-inhabiting microorganisms having properties to mobilize and augment nutrients from unavailable to available forms so that these are easily taken up by plants. The basic aim of their use in agriculture is to increase their population in terms of quantity and quality of soil or around the roots to allow them to carry out enhanced metabolic activities. These are also referred to as microbial inoculants as they contain living/latent cells of different types of microorganisms. Seed inoculation with biofertilizer is belonging to one of the categories *viz.* nitrogen fixing, phosphate solubilizing and mobilizing, and plant growth promoting. Nitrogen fixing organisms fix atmospheric nitrogen into forms which are readily taken up by plants, and these include *Rhizobium* and *Azotobacter*. Phosphate solubilizing and mobilizing microorganisms dissolve or mobilize inorganic and organic sources of phosphorous for easy uptake by plants. Certain groups of bacteria enhance the growth of plants through their ability to produce various compounds including phytohormones, organic acids, siderophores; fixation of atmospheric nitrogen; phosphate solubilization; antibiotics and some other unidentified mechanisms. Some of the rhizobacteria can directly promote the plant growth by the production of hormones. These rhizobacteria positively influence plant growth and health and are often referred as plant growth promoting rhizobacteria (PGPR).

However, their effects are complex and cumulative because of interactions of plants, pathogens, antagonists and environmental factors. Therefore, seed inoculation with biofertilizer is much more important to increase the productivity as well as production of all the pulse crops. There are certain crop-specific biofertilizers whereas others are common to many crops (Table 1).

Table 1. Types of biofertilizers used for seed inoculation in pulses

Types of biofertilizers	Contribution	Target crops
Nitrogen Fixing: *Rhizobium*	20-30 kg N ha^{-1} $Season^{-1}$; 10-35% increase in crop yield	Gram, pea, lentil, Soybean, lucerne, clover etc.
Phophate solubilizing	Makes 30-35 kg P_2O_5 ha^{-1} available to plants; increases grain yield; produces growth promoting substances.	All agricultural crops including pulses
Phosphate mobilizing	Saves 25-30 % of phosphatic fertilizers; helps in uptake of water; protects from root pathogens.	All agricultural crops includeing Pulses
Plant Growth Promoting Rhizobacteria (PGPR)	Produces plant hormones; supplies nutrients like biologically fixed N or solubilizing P; suppresses pathogens	All agricultural and horticultural crops including pulses

Importance of Pulse Crops:

1. Pulses are rich in proteins and found to be main source of protein to vegetarian people of India.
2. It is second important constituent of Indian diet after cereals.
3. They can be grown on all types of soil and climatic conditions.
4. They give ready cash to farmer.
5. Pulses being legumes fix atmospheric nitrogen into the soil.
6. They play important role in crop rotation, mixed and intercropping as they help maintaining the soil fertility.
7. They add organic matter into the soil in the form of leaf mould.
8. Pulses are generally not manured or require less manures.
9. They are helpful for checking the soil erosion as they have more leafy growth and close spacing.
10. They supply additional fodder for cattle.
11. Some pulses are turned into soil as green manure crops.
12. Majority of pulses are of short duration so that second crop may be taken on same land in a year.
13. They provide raw material to various industries.

Benefits of Growing Pulses in Rice-based Cropping Systems

Various pulses/legumes associated with rice-based cropping systems can bring about following benefits (Pravakaran and Rangarajan, 2010):

(a) *Soil fertility enhancement:* Because of addition of organic matter through incorporation of above- and below-ground portion of the legumes, soil fertility status including organic fraction is enhanced.

(b) *Nitrogen addition:* Legumes by their potentiality to fix nitrogen from atmosphere add nitrogen to benefit the standing crop and also the succeeding crop. In

general, nitrogen fixing capacities of different pulses (legumes) vary depending upon the kind and genotype of legume, soil type and other environmental conditions under which they are grown. The amount of nitrogen fixed ranges from 0 to 167 kg N ha^{-1}.

(c) *Increased N uptake in rice:* When legumes are grown in rice solely for green manure production and incorporated, the succeeding rice crop takes up more nitrogen and reduces requirement of nitrogen for rice. There are several reports that rice produced more grains after a legume than after a non-legume or after a fallow, only due to increased nitrogen uptake.

(d) *Suppression of pests:* By raising a legume in between two rice crops or before a rice crop in the succeeding year, building up of insect pests and diseases of rice is checked. Moreover, the weed growth in the soil is also arrested.

Nitrogen Fixing Biofertilizers

The atmosphere around us contains about 78% nitrogen (by volume), but it cannot be utilized in free form by plants. Certain microorganisms have the ability to use this atmospheric nitrogen under normal conditions and convert it to ammonia which can then be easily taken up by plants. These are called nitrogen fixing microorganisms. *Rhizobium* is most widely used among all nitrogen fixers which colonize the roots of specific leguminous plants to form root nodules. *Bradyrhizobium, Mesorhizobium*, *Sinorhizobium* and *Azorhizibium* in association with leguminous plants reduce atmospheric nitrogen and provide alternative to the use of energy expensive ammonium fertilizer (urea).

Table 2. Cross-inoculation groups and *Rhizobium*-legume associations

Cross-Inoculation Group	*Rhizobium* Species	Host genera	Legumes included
Alfalfa-group	*Rhizobium meliloti*	*Medicago*	Alfalfa
		Melilotus	Sweet clover
		Trigonella	Fenugreek
Clover group	*Rhizobium trifolii*	*Trifollium*	Clovers
Pea group	*Rhizobium leguminosarum*	*Pisum*	Pea
		Vicia	Vetch
		Lathyrus	Sweet pea
		Lens	Lentil
Bean group	*Rhizobium Phaseoli*	*Phaseolus*	Beans
Lupine group	*Rhizobium lupini*	*Lupinus*	Lupines
Soybean group	*Rhizobium japonicum*	*Glycine*	Soybean
		Vigna	Cowpea
		Pueraria	Kudzu
		Arachis	Peanut
		Phaseolus	

It is believed that legume-*Rhizobium* symbiosis can contribute at least 70 million metric tons nitrogen year^{-1}. Although the rhizobia are specific for leguminous crops, every *Rhizobium* cannot colonize every leguminous crop. As the number of host plants is limited, cross-inoculation groups have been established. A cross-inoculation group refers to a collection of leguminous species that are capable of developing nodules when exposed to bacteria obtained from the nodules of any member of that particular plant group. Some cross-inoculation groups and *Rhizobium*-legume associations are given in Table 2.

All these different rhizobia have been developed as biofertilizer inoculants and the farmers should use the right one for a particular crop. Application of the inoculants to the seed surface prior to sowing is the traditional, most commonly used means of inoculation. An appropriate strain can increase the crop yield up to 10-35% and nitrogen saving of 20-30 kg ha^{-1} season^{-1}.

Phosphate Solubilizing and Mobilizing Bacteria

Phosphorous is only next to nitrogen in terms of nutritional elements required by plants and it is the important nutrient element required for successful production of any grain legumes. Biofertilizers, which contain living or latent cells of efficient strains of phosphate-solubilizing microorganisms, are able to convert from unavailable forms of phosphorous to their available forms through biological processes (Vessey, 2003), thereby enhancing soil fertility and crop yield. The phosphate requirement of crop is often met by addition of phosphatic fertilizers but only 15-20% of added P-fertilizer is available to the plants as rest gets fixed in the soil as metal phosphate. There are certain microorganisms, which play a major role in the solubilization and uptake of native and applied phosphorous. These are otherwise referred to as phosphate solubilizing microorganisms (PSM). PSMs include several bacteria, fungi, actinomycetes and cyanobacteria, dominant species of *Bacillus, Pseudomonas, Aspergillus, Penicillium, Anabaena*, etc. which bring about solubilization of bound phosphates in soil. These efficient cultures can be multiplied on mass scale and developed as inoculants. Their inoculation results in solubilizing insoluble inorganic phosphates and can also mineralize organic phosphatic compounds present in soil. Inoculation of PSMs to seed or seedlings makes 30-35% kg P_2O_5 ha^{-1} available to plants and increases the grain yield of plants. It is also possible to use non-conventional sources of phosphorous like rock phosphate while using PSMs which produce the same yield as with super phosphate (Tilak, 1993). PSMs have also been reported to produce growth promoting substances. Besides phosphate solubilization, there is another group of microorganisms which help in mobilizing nutrients for uptake by plants especially those less mobile in soil solutions like P. They also help in uptake of water and protect roots from root pathogens. The microorganisms responsible for this are certain fungi called arbuscular mycorrhizal (AM) fungi. These form symbiotic association with the roots of plants important in agriculture, horticulture and tropical forestry. Nearly 25-30% of phosphatic fertilizer can be saved through use of AM fungi.

Plant Growth Promoting Rhizobacteria

Some of the microorganisms are attracted by nutrients exuded from plant roots and this "rhizosphere effect" was first described by Hiltner (Hiltner, 1904). He observed higher numbers and activity of microorganisms in the vicinity of plant roots. The rhizosphere and rhizoplane are colonized more intensively by microorganisms than the other regions of the soil. Some of these microorganisms not only benefited from the nutrients secreted by the plant roots but also beneficially influence the plants, resulting in a stimulation of their growth. For instance, rhizobacteria can fix atmospheric nitrogen, which is subsequently used by the plants, thereby improving plant growth in the soil deficient of nitrogen. Other rhizobacteria can directly promote the plant growth by the production of hormones. These rhizobacteria positively influence plant growth and health, and often referred as plant growth promoting rhizobacteria (PGPR). However, their effects are complex and cumulative because of interactions of plants, pathogens, antagonists and environmental factors (Schippers, 1992).

Genera of PGPR include *Azotobacter*, *Azospirillum*, *Pseudomonas*, *Acetobacter*, *Burkholderia*, *Bacillus, Paenibacillus,* and some are members of the Enterobacteriaceae. Direct use of microorganisms to promote plant growth and to control plant pests continues to be an area of rapidly expanding research. Rhizosphere colonization is one of the first steps in the pathogenesis of soil-borne microorganisms. It is also crucial for the microbial inoculants used as biofertilizers, biocontrol agents, phytostimulators, and bioremediators. *Pseudomonas* spp. are often used as model root-colonizing bacteria (Lugtenberg *et al*., 2001). Motile rhizobacteria may colonize the rhizosphere more profusely than the non-motile organisms resulting in better rhizosphere activity and nutrient transformation.

The beneficial free-living soil microorganisms isolated from this region having ability to improve plant health or increase yield are referred as PGPR. The effects of PGPR on plant growth can be mediated by direct or indirect mechanisms (Glick, 1995). The direct effects are attributed to the production of plant hormones such as auxins, cytokinins and gibberellins; or by supplying nutrient like biologically fixed N or solubilizing P. The indirect mechanisms include suppression of pathogens by production of siderophores, HCN, ammonia, antibiotics and other metabolites by induced systemic resistance and/or by competing with the pathogen for nutrients or for colonization space.

Conclusion

More than 70% of total population in India is directly or indirectly dependent on agriculture and majority of the farm holdings are small (1-2 acre of land) and marginal (less than 1 acre of land) in size. It is very difficult for those farmers to purchase and use the recommended doses of fertilizers at recent hike prices. In this situation, biofertilizer is one of the alternative source which is less expensive and environmentally safety sources to maximum gain. Pulse crops have an excellent power to fix atmospheric

nitrogen. The practice of appropriate biofertilizer management may be a great solution for improving the soil fertility as well as the productivity of pulses.

The importance of seed inoculation with biofertilizers in agriculture is not only as a source of nutrient supplement but also to stimulate plant growth and control or inhibit the activity of plant pathogens. The extensive use of fertilizers has, no doubt, led to an increase in food grain production enabling us to become self sufficient but we are yet to ensure food security to our growing population. This is due to the declining food quality resulting from indiscriminate use of chemicals which have been degrading the soil health, making it deficient of secondary and micronutrients. Seed inoculation with biofertilizers offer the best cost-effective alternative to meet the nutrient requirement of crop as well as replenish the nutrient poor soil to make it more fertile, productive and sustainable. It is also observed that food grains grown using seed inoculation with biofertilizers and other organic inputs are healthier as it has far less residues of pesticides and other chemicals. They also contain more vitamins, nutrients and minerals. Essential amino acids, fatty acids and other nutrients and those are more important for human health. The seed inoculating organisms described here are produced commercially and easily available.

Use of seed inoculating organisms as biofertilizers not only provides economic benefit but also improves and maintains soil fertility and sustainability in natural ecosystem. These will be integral component of our future farming system. From the points of sustainable agricultural development and good eco-environment establishment, use of biofertilizers in sustainable pulse production, besides improving soil health and fertility, is a scientific proposition.

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3

Women Empowerment: Some Issues

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Abstract

Women empowerment is a hotly debatable issue in India. The women enjoy much lower status than men in this sub-continent. The barriers are economic, educational, social and nutritional. Economically, a woman can not progress better as she is often illiterate. The literacy rate among women is much lower than men. Male – female ratio is uneven in India (it is 940 women per 1000 men). Women are often exploited and deprived by their male counterparts. Mainly, women from rural areas belong to the deprived section of the society. The Government of India takes various steps to uplift the position of women in the society. It starts many programmes i.e. MDG taken by UNDP to ensure equity and peace across the world. Government of India's MDG report notes that the participation of women in employment and the decision-making remain far less important than that of men.

Many actions are taken to empower the women on the part of the Government of India. The creation of the Ministry for the Women and Child Development, Swayamsidhha Programme, National Commission for Women - are some of the examples of the ventures of the government. There are some laws also for the protection of women from domestic violences and social violences against them. In the British era the Act of Sati (abolish) 1829, Hindu Women Remarriage Act, 1856 were passed. The minimum age of marriage for the girls was raised to 12 years in 1872 and legal sanction was accorded to inter-caste and inter-community marriage. The trend of framing social legislations by the Indian Parliament was continued in the post independent India and the following acts have been passed over the years for the upliftment of the conditions of the Indian women and protection of their substantive rights as guaranted in the part 3 and 4 of the Indian Constitution, i.e. The Suppression of Immoral Traffic in Women and Girls Act, 1956, Dowry Prevention Act, 1961 etc. but unless our society becomes truly

educated, the framing of laws can not change the humiliating position of women of our society.

Keywords: *Women, empowerment, law, education, poverty, health, mal-nutrition*

Empowerment – The Concept and the Background

The origins of the concept of empowerment go back to the Civil Rights Movement in the USA in the 1960s. It has since then been interpreted differently and filled with new meanings and is today used in such different sectors as business, social work, development, discourse etc.

The empowerment of women located within discourse and agenda of gender equality and is increasingly being taken in the agendas of international development organizations perhaps more as a means to achieve gender equality than as an end in itself. At the social summit in Copenhagen in 1993 and the International Conference on Population and Development in Cairo, 1994, representatives of different countries committed themselves to the empowerment of women. This commitment was operationalised and formulated into a clear action plan at the fourth World Conference on women in Beijing in 1995 where governments of different countries committed themselves to the empowerment and advancement of women, including the right to freedom of thought, conscience, religion and belief — thus contributing to the moral, ethical, spiritual and intellectual needs of women and men individually or in community with others and thereby granting them the possibility of realizing their full potential in society and shaping their lives in accordance with their own aspirations.

Needs for Women Empowerment

Despite of the various measures taken up by the government after independence (1947) and even during British rule the women of our country (India) have not been fully empowered. The male – female ratio though improved over last few years is still far from satisfactory. It is 940 women per 1000 men in India, at present. In some states it is as much lower as 877. These are the states where female foeticide is maximum. The female literacy rate is also lower than the male literacy rate.

The ground reality is deprivation, degradation and exploitation of women, specially, women from rural areas and those belonging to deprived sectors of the society. In our country the women are being brutalized, commoditized and subjected to inhuman exploitation and discrimination. Despite of reservation granted to women in panchayat elections after 73rd and 74th constitutional amendments, in many Panchayats the male chauvinism does not allow the women functioning independently. So, we have to fight against various hindrances in the way of women empowerment.

Empowerment of Women

Empowerment of women would mean equipping women to be economically independent, self-reliant, have positive esteem to enable them to face any difficult situation so that they should be able to participate in the process of decision-making. In

the simplest of words it is basically the creation of an environment where women can make independent decisions on their personal development as well as shine as equals in society. Women want to be treated as equals so much so that if a woman rises to the top of her field it should be a commonplace occurrence that draws nothing more than a raised eyebrow at the gender.

Thus, it is no real surprise that women empowerment in India is a hotly discussed topic with no real solution looming in the horizon except to doubly redouble our efforts and continue to target the sources of all the violence and ill-will towards women.

There are several challenges that are currently plaguing the issue of women's rights in India. A few of these challenges are presented below.

Education

While the country has grown vastly since it's independence where education is concerned the gap between women and men is severe. While 82.14% of adult men are educated, only 65.46% of adult women are known to be literate in India, at present. Not only an illiterate woman lives at the mercy of her father or husband, she also does not know that this is not the way of life for the women across the world. Additionally, the norms of culture that state that the man of the family is the be-all and end-all of family decisions is slowly spoiling the society of the country.

Eradicating this gap and educating women about their real place in the world is a step that will largely set this entire movement rolling down the hill to crash and break the wall of intolerance, negligence and exploitation.

Globalization and Poverty

Benefits of the growing global economy have been unevenly distributed leading to wider economic disparities. Poverty increased gender inequalities through often deteriorating working conditions and unsafe working environment specially, in the informal economic sectors and rural areas. Strategies should be designed to enhance the capacity of women and empower them to meet the negative social and economic impacts which may flow from the globalization process.

Poverty is considered the greatest threat to peace in the world, and eradication of poverty should be a national goal as important as the eradication of illiteracy, due to abject poverty, women are exploited as domestic helps and wives whose incomes are usurped by the man of the house. Additionally, sex-slaves are a direct outcome of poverty, as an example, we can mention the cases of sex–trafficking in Andhra Pradesh.

Andhra Pradesh accounts for nearly half of all sex trafficking cases in India, the majority involving adolescent girls. According to police diaries a shocking 300,000 women and girls have been trafficked for exploitative sex work from Andhra Pradesh. Of these, just 3,000 have been rescued so far. If poverty were not a concern then the girl child will be able to follow her dreams without concerns of sexual exploitation, domestic abuse and illiteracy or domestic/exploitative works.

The state is relatively prosperous, ranking fourth in terms of per capita GDP in India, but it is also home to some of the poorest people in the country.

Health and Safety

Obstructed The health and safety concerns of women are paramount for the wellbeing of a country, and is an important factor in gauging the empowerment of women in a country. However, there are alarming concerns where maternal health care is concerned.

In it's report (2009), UNICEF came up with shocking figures on the status of new mothers in India. The maternal mortality rate of India stands at 301 per 1000, with as many as 78,000 women in India dying of childbirth complications in that year. Today, due to the burgeoning population of the country, the number is sure to have multiplied considerably. The main causes of maternal mortality are:

Haemorrhage:	30%
Anaemia:	19%
Labour:	10%
Sepsis:	16%
Abortion:	08%
Toxaemia:	08%

UNICEF report (June 30, 2011) finds that South Asia is the only region which shows a gender bias with regard to child nourishment, with girls more likely to be underweight than boys. One in three adult women in India is underweight and therefore at risk of delivering babies with low birth weight.

One of the major causes for malnutrition in India is gender inequality. Due to the low social status of Indian women, their diet often lacks in both quality and quantity. So, new born infants are unable to get adequate amount of nutrition from their mothers.

While there are several programmes that have been set into motion by the Government and several NGOs in the country, there is still a wide gap that exists between those under protection and those not. Poverty and illiteracy add to these complications with local quacks giving ineffective and downright harmful remedies to problems that women have. The empowerment of women should be begin with a guarantee of their health and safety.

Actions Taken to Empower Women

Millennium Development Goal

The United Nations Development Programme constituted eight Millennium Development Goals (MDG) for ensuring equity and peace across the world. The third MDG is directly connected to the empowerment of women. The MDGs are agreed upon goals to reduce certain indicators of disparity across the world by the year 2015.

The third MDG is centered towards promoting gender equality and empowering women, the goal is – "Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education by no later than 2015."

While India's progress in this front has been brave, there are quite a few corners that it needs to cut before it can be called as being truly revolutionary in it's quest for understanding what is women empowerment. As UNDP reports – India missed the 2005 deadline of eliminating gender disparity in primary and secondary level of education. However the country has hastened progress and Gender Parity Index (GPI) for Gross Enrolment Ratios (GER) in primary and secondary education has risen. Given current trends, India is moderately or almost nearly on track. However, as the Government of India MDG report, 2009 notes – "Participation of women in employment and decision making remains far less than that of men, and the disparity is not likely to be eliminated by 2015. Achieving GPI in tertiary education also remains a challenge. In addition, the labour market openness to women in industry and services has only marginally increased from 13% – 18% between 1990-1991 and 2004-2005."

Ministry for women and child development

The ministry for women and child development was established as a department of Human Resource Development in the year 1985 to drive the holistic development of women and children in the country. In 2006, this department was given the status of a ministry with the powers to formulate plans, policies and programmes enacts/amends legislation, guiding and coordinating the efforts of both governmental and non-governmental organizations working in the field of women and child development.

It delivers initiatives such as Integrated Child Development Services (ICDS) which helps the growth and nutrition of both mothers and children, specially, in poverty stricken belts of our country and thus helps the motto of women empowerment to some extent.

Swayamsidhha programme

Additionally, the ministry is also implementing the Swayamsidhha Programme—an integrated scheme for the empowerment of women at a total cost of ₹ 116.30 crores. Core to this programme will be the establishment of women's self-help groups, which will empower women to have increased access to all kind of resources that they are denied, in addition to increasing their awareness and skills. This programme will benefit about 9,30,000 women with the setting up of 53,000 self-help groups, 26,500 village societies and 650 block societies.

National Commission for Women

The National Commission for Women is a department within the Ministry of Women and Child Development. It was set up exclusively to help women via the constitution – by reviewing legal and constitutional safeguards for women, recommending remedial

legislative measures by facilitating quick reprisal of grievances and by advising the Government of India on all policy matters affecting women.

The website allows for online submission of complaints and fast reprisal exclusively for women. Additionally, it is also a good resource of information for women and the commission is committed to helping out women in need.

Some Laws Created for the Empowerment of Women

There are some laws which are made to protect women from the social and domestic violence.

The Hindu Marriage Act, 1955 has determined the age for marriage, under the Hindu Adoption and Maintenance Act,1956 an unmarried woman, widow or divorcee of sound mind can also take child in adoption. The Dowry Prevention Act of 1961 says that any person who gives, takes or abets the giving or taking of dowry shall be punished with imprisonment — which may extend to six months or fined up to ₹ 5000 or with both.

The Constitution of India of India guarantees equality of sexes and in fact grants special favour to women. These can be found in three articles of the constitution. Article 14 says that the government shall not deny to any person the equality before law or equal protection of the law. Article 15 declares that government shall not discriminate against any citizen on the ground of sex. Article 15(3) makes a special provision enabling the state to make an affirmative discriminations in favour of women. Article 42 directs the state to make provision for ensuring just and human conditions of work and maternity relief. Above all, the constitution regards a fundamental duty on every citizen through articles 15(A), (E) to renounce the practices derogatory to the dignity of women.

The 73rd and 74th amendments to the constitution of India have provided some special powers to women by introducing the 33% reservation of seats at panchayat level and at the Upper House of the parliament. The new Panchayati Raj is the part of the effort to empower women at least at the village level.

The most positive development for last few years has been the growing involvement of women in the Panchayati Raj institutions. There are many elected women representatives at the village council level. At present, all over India, there are total 20,56,882 lacs Gaon Panchayat members. Out of these, the number of women members is 8,38,244 (40.48%). The total Anchalik Panchayat members are 1, 09, 324, out of these, the number of women members is 4,923 (42.05%). The economic empowerment of women is being regarded these days as a sine – quo – non of progress in a country

Violence Against Women and Laws to Prevent It

Gender inequality in India can be traced back to the historic days of the Mahabharata when Draupadi was put on the dice by her husband as a commodity.

In the early twentieth century it was the rise of the National Movement under the

leadership of M.K. Gandhi who was in favour of removing all disabilities of women. At the same time Raja Rammohan Roy, Iswar Chandra Vidyasagar and various other social reformers laid stress on women's education, prevention of child marriage, withdrawals of evil practices of sati, removal of polygamy etc.the National Movement and many other reform movements paved the way for their liberations from the social evils and religious taboos. In this context we may write about the Act of Sati (abolish) 1829, Hindu Women Remarriage Act 1856, by passing a legislation in 1870 the female infanticide was banned in the country. The minimum age of marriage for the girls was raised to 12 years in 1872 and legal sanction was accorded to inter- caste and community marriage.

After independence of India, the constitution makers and the national leaders recognized the equal, social position of women with men. The voting right of the Indian women was recognized by taking a decesion in Madras Province in 1929 and the Child Marriage Restrain Act was passed. The trend of framing social legislations by the Indian Parliament was continued in the post independent India and the following acts have been passed over the years for upliftment of the conditions of Indian women and protection of their substantive rights as guaranteed in part 3 and 4 of the Indian Constitution. The laws are:

The Suppression of Immoral Traffic in Women and Girls Act, 1956

The Dowry Prevention Act, 1961

Indecent Representation of Women Act, 1986 (prohibition)

The Commission of Sati (prevention) Act, 1987

The Prevention of Domestic violence Act, 2005

The Indian Penal Code was also amended by incorporation of the section 498(A) of the I.P.C. for prevention of cruelty against the Indian women. The primary object behind the said amendment was to fight the cruelty shown against the married Indian women by the husband or the relatives of husband by demanding dowry.

According to the section 498(A) OF the IPC any offender who:

(a) subjects willfully a woman to such a situation so as to instigate her to commit suicide or to cause grave injury or damage to life, limb or health whether mental or physical, or

(b) harassment of such nature, which will coerce her or any of her relatives to meet any unlawful demand for any property or valuable security or on account for her failure or any person related to her to meet such demands, will be dealt with stringently. The section has embodied two aspects, first is the scope for dealing with the cruelty by the husband or his relatives to a woman. The other aspect of the law framed is that, owing to the harassment, if she commits suicide or causes grave injury or danger to her life out of great depression, the perpetrator of the crime should be punished within the purview of the law.

If a charge brought against an accused is proved beyond reasonable doubt, the penalty of imprisonment upto three years with fine may be imposed by a court of law on the accused.

The section 304(B) of the IPC has also added new wings to the law enforcing agencies and the criminal courts to deal with the dowry related offences. Within the purview of the section 304(B) of the IPC, where the death of a women is caused by any burns or bodily injury or occurs otherwise than under normal circumstances within seven years of her marriage, and it is proved that before the death of the victim, she was subjected to torture, harassment or cruelty by the husband or any relative of her husband for or in connection with, any demand for dowry, such death shall be called "dowry death" and the husband or relative of him would be held responsible for causing death to her. The penalty for the offence has also been clearly defined and the offender may be punished by sentencing him to imprisonment for a period of seven years. The trial court may even impose the penalty of life imprisonment on an offender by taking into consideration the gravity of offence and circumstances.

The section 354 of the IPC states that whoever assaults or uses criminal force to any woman, intending to outrage or knowing it to be likely that, he will thereby outrage her modesty, shall be punished with imprisonment of either description for a term which may extend to two years, or with fine or with both. Besides, the availability of such sections in the IPC with other legislations in India for dealing with the cases of cruelty, harassment and ill treatment of women, the desired results have not been shown by such laws so far as the crime rate is concerned.

The framers and founding fathers of our constitution incorporated certain sacrosanct ideals in the form of comprehensive rights for women so as to transform the abstract ideals into a concrete form, which would enable the upliftment of the women in the male dominated chauvinistic society. The statutes and constitutional safeguards have not delivered efficacious results in protection of the rights of women and transforming the goals of their empowerment into a reality. The violence against women has increased in a higher rate over the years which has been corroborated by the records of the National Crime Record Bureau of the Ministry of Home Affairs, Government of India, New Delhi. Besides the availability of such sections in the IPC along with other legislations in India for dealing with the cases of cruelty, harassment and ill treatment against women, the desired results have not been shown by such laws so far as the crime rate is concerned.

Unless the attitude of the male dominated society changes towards women, laws will remain as "tigers of paper". The crux of the problem is that, inspite of having plethora of legislations in India to prevent the commission of crimes against women and for implementation of the constitutional rights of women, the rate of crime against women has not come down. The attitude of the society towards women has also not changed in spite of increase in the literacy rate of the country.

Percentage Variation in 2010 Over 2009

Sl. No.	Crime Head	Year 2009	Year 2010	%variation
1.	Rape (section 376 IPC)	21,399	22,172	3.6
2.	Kidnapping and abduction (section 363 to 373 IPC)	25,741	29,795	15.7
3.	Dowry Death (section 302/304 IPC)	8,383	8,391	0.1
4.	Torture [section 498(A)IPC]	89,546	90,041	5.0
5.	Molestation (section 354 IPC)	38,711	40,613	4.9
6.	Sexual Harassment (section 509 IPC)	11,009	9,961	-9.5
7.	Importation of Girls [section 366(B) IPC]	48	36	-25
8.	Immoral Trafficking (prevention) Act, 1956	2474	2499	1.0
9.	Dowry Prohibition Act, 1961	5650	5182	-8.3
	Total	2,03,804	2,13,585	4.8

The empowerment of women will remain a distant dream to be realized, unless the women are given due share in the property both parental and matrimonial. The passing of the Hindu succession (Amendment) Act, 2005 and cabinet approval to the changes brought in the Marriage Laws (Amendment) Bill, 2010 have been hailed by the civil society. As reported in English Daily, "Deccan Herald" on May 17, 2012, the Union Cabinet of India had already accorded approval for giving wife and children a clearly defined share in the husband's immovable property. The Union Cabinet chaired by the then Prime Minister Manmohan Singh, has approved a provision that both husband and wife seeking divorce shall have to file petitions together for waiving of six months cooling period.

The Indian parliament having understood the inherent spirit of the Articles 14, 15, 16 and 19 of the Constitution of India amended the law by incorporating Hindu women's rights to become a coparcener in the ancestral property like the male counterparts. The section 6 of the Act (Hindu Succession (Amendment) Act, 2005), clearly states that the daughters will get equal rights in the ancestral properties with the male counterparts. As per the new amendment, daughter of a coparcener by birth will become a coparcener in her own right in the same manner as the son and the law passed by Parliament has thereby removed the discrimination in claiming the share by the daughters in the ancestral properties of a coparcener.

Therefore, it may be reasonably stated that in India, over the years, the state has been endeavoring for ensuring economic security for women by protection of the rights and interests on the given context. However, the end has not still come to the process, which may simply be termed as the end of the beginning from socio-legalistic point of view.

The Hindu Succession Act, 1956 having converted the women's estate to stridhan has safeguarded the interests of the females to some extent in question of inheritance of property, although the same is not flawless. As per the section 15 of the said Act, a daughter-in-law cannot claim the right to inherit her due share from her father-in-

law's property when the husband is alive. So far as the applicability of the section 15(b) of the act is concerned, property inherited by a female Hindu from her husband or her father-in-law shall not dissolve in the absence of son or daughter of the deceased (including the children of any predeceased son or daughter) upon other heirs referred to the sub-section (1) in the order specified therein, but upon the heirs of the husband. The section 23 of Act also states that rights of female heirs to claim partition of the dwelling house shall not arise until the male heirs choose to divide their respective shares therein.

Issue of Crime Against Women

The issue of women empowerment is closely associated with the rate of crimes against women, as the spirit of empowerment shall not be translated into reality, unless the crimes against women are not controlled. Vivekananda once said "Just as a bird could not fly with one wing only, a nation would not march forward if the women are left behind".

The empowerment of the women would remain swaddled in quixotic framework, if the society continues to humiliate, suppress, torture (physical or mental) and perpetrate sexual assaults on them. It appears that, Indian society has not yet either understood the spirit of the Fundamental Rights embodied on the constitution of India along with its preamble or has failed to accord due importance towards the implementation of the spirit so embodied in the constitution into reality due to untrammeled intransigence of the male dominated society to grant equal status to females in socio-economic life.

However, legislations and other external instruments cannot empower and ensure justice for women, internecine urge towards empowerment is also very important. The external support may be extended to them for identification of the inherent qualities for participation in the different walks of life as a member of the civilized society and knowledge driven economy. The role of the external factors in increasing self-reliance and self confidence of women is important, but such efforts would turn interminable and ill-disposed to a woman, if she does not come forward to accept the opportunities by transcending the hurdles found in a gender biased social life. The empowerment of poor, disadvantaged women would lead to benefit at two levels, one direct benefit to the individual women, women's groups and the other development benefits for the poor families, the communities and the village as a whole.

Even in the matrilineal societies of the tribal states like Meghalaya, the participation of women in the political life specially, in a decision making process is not encouraging, though the rate of property inheritance by the women is encouraging. Almost 85% of the total female heads of households of Meghalaya are neither members of any club, community centre nor social organizations. The empowerment from within would add a meaningful edge to the fair sex for availing of opportunities in the social life.

The empowerment of women got official importance in the five years plan for the first time in India during the eighth plan period. During the ninth plan, the concept of women empowerment in the plan was formally introduced and specific ministries

were created to ensure the flow of fund to the women's programmes and schemes. During the tenth plan period emphasis was made in the reduction of gender gap in literacy, wage rates etc. the process of empowering women through the measures like legislation, judicial activism, policies and programmes has been continuing over the years and before the commencement of 11th plan period an analysis was made by a working group on the status of women. The maternal mortality rate was 407 per 1,00,000 births in India, compared to 92 in Shri Lanka, 56 in China and 130 in Vietnam. The rate of female foeticide has not declined in India and the child sex ratio declined from 945 in 1991 to 927 in 2001, the census data of 2011 discloses the fact that women in India are not safe even from the embryonic stage. The child sex ratio in the age group (0-6) (the number of girls against 1000 boys) in 2001 was 927 and the same has become 914 in 2011 which is staggeringly the lowest in India since independence.

Further escalation in number of incidents of sexual assaults on women over the years in the country indicates that the constitutional and the statutory protective shield is not functioning properly for protection of women from violence and discrimination. The incidents of rape at the hands of state agencies like "Armed Force" on many occasions have rendered nugatory the framework of legal protection framed for the women for saving them from violence. The Indian army during a search operation against the terrorists in the village of Kunan Poshpara in 23.02.1991, of Kupwara district of Jammu and Kashmir, as alleged raped about 53 (fifty three) women. The Government denying charges as baseless, even ignored legal actions. On March 17, 1991, Bahanud-Din Farooqi, the then Chief Justice of Jammu and Kashmir High Court, leading the fact finding mission to Kunan Poshpora, viewed that, In his forty three years in Bench, he had never seen a case in which normal investigative procedures was ignored as done in this one.

The country also witnessed a diabolic incident which transcended all the limits of brutality, on 11.07. 2004 when soldiers of 17 Assam Rifles killed a young lady named Monorama in Imphal East district of Manipur and the dead body was found containing the clear marks of injury caused by bullets at her back and genital organs which indicated the commission of sexual assaults on her. Distinguished feminists like Susan Brownmiller, Andrea Dworlein therefore considered that infliction of humiliation on a woman has been found to be central behind an incident of rape on many occasions, as rape is not always manifestation of extreme sexual urge of the offender.

Role of NGOS

Various non-governmental organizations are functioning for the betterment of the position of women. But this work requires some multi-dimensional approaches and hence a large number of voluntary organizations/NGOs have gained increased attention in the field from grass root level to national and international level. The working style of NGOs is open, transparent and personal. So, their works are more effective for the upliftment of the women's position in the society. They organize seminars, conferences and the workshops for the awakening of the masses. They prepare urban and rural

uneducated women for self employment, which is vital for the economic empowerment of the women. Though, it is true that government policies often act as barriers on the free functioning of the NGOs.

Conclusion

The gender discrimination being deep rooted in our society may be uprooted by concerted efforts of the society, government and judiciary. The judicial activism cannot solely fight the gender discrimination unless supported by an accountable government machinery and reciprocal social response to the vital cause.

The future of India as a welfare state will remain clouded unless the women are allowed to participate in nation building process and a congenial atmosphere is created for intellectual and economic empowerment of the women. The empowerment of women from within being not less important than external, sensitization of the society to this vital cause is the clarion call of the hour. The process required to be an important one, a fortiori should represent all the elements necessary for true implementation of the principle of gender justice in our country and education being the most reliable weapon for the purpose, should create the opportunities for the move towards stonewalling the process.

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4

Exploitation Behind Employment, the Dark Reality for Women Workers in India: A Situation Analysis and Remedial Recommendation

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Introduction

Gender discrimination in economic sectors is one of the crucial barriers for development for a progressive, democratic and welfare state like India. Equal opportunities and safety in workplaces as well as special benefits for female workers on job should be the major policy concern of Women Empowerment for this country. Worldwide campaigns and sensitization drives in favour of empowerment, gender equality and safety for women at work are continuously on progress now a day. The Millennium Development Goals also emphasize on preventing gender biasness and ensuring gender equality in the labour market. Unfortunately the real situation of women workers even worldwide is something terrible than thought. Not only in case of India but in case of other developing and even in developed countries like USA the exploitations of women workers in workplaces exist in abundance. Say for instance the absence of Maternity Benefits for women workers in Indian factories exists in spite of having legal provisions (Achary 1996, p. 74, cited by Zaman 2001, p. 231). A survey in Bangladesh reflects the same type of exploitation for the women workers in factories there. Evidences of wage discrimination in India in various industrial sectors are also found in abundance. It is seen that women workers are getting almost 40%-50% lesser wages than men for same work in India (Chaudhuri & Panigrahi 2013, p. 114). Bangladesh is also reported with the similar problem. Though there is no marriage bar for employment in Bangladesh but it has been seen that the entrepreneurs there prefer to employ unmarried or widowed women to save themselves for discontinuing of women workers due to maternity leave and other family affairs. The women workers there also suffer from frequent job loss due to absence of job security tenure or job contract. This problem is predominant even in organized labour market in Bangladesh (Zaman 2001, p. 231). In spite of having *'The Unorganized Workers Social Security Act, 2008'* the exploitations

of women workers in these sectors remain almost unchanged. In her study among women workers in unorganized sectors in Haryana, Dr. Dave (2012) found that the majority of the women workers in Construction Industry work for 9-10 hours daily. The study also reveals that a very nominal portion of women workers there get medical facilities, accidental benefits and child care facilities. 74% of the respondents of this study reported for exploitation by the employers. In USA '*Sexual harassment in the workplace is widespread* (Levy & Paludi 1997, cited by Paludi & Barickman 1998).' They also cited the research findings of Barbara Gutek (1985) where it was found that in civilian workplaces in USA at least 50 % of women workers experienced Sexual Harassments and a total number of 53% of working women there faced at least one incident of such exploitation in workplace during their working lives.

In case of mining industry in India the Women workers are vulnerable to sexual exploitation, HIV/AIDS and other sexually transmitted diseases at the work place. Women, especially the adolescent girls, face physical, verbal and sexual abuse at the mine sites from male workers and contractors. Beside these a large number of female workers in various hazardous industries like tobacco, construction, mines etc. suffer from chronic and annoying health problems due to lack of protective and preventive measures. In India the average rate of Women workers in various occupational sectors varies from 20% to 40%. The Gender biased mentality of employers and exploitations against women in workplaces may be counted as the major reason behind such poor participation of women in industrial sectors. Women play the three dimensional role of a worker, homemaker and mother in our country. The lack of financial capital, wage discrimination, poor job security level aided by frequent accidents, sickness and sexual harassments in workplaces, low bargaining power due to illiteracy and lack of outside linkages, lack of opportunities for skill up-gradation - all of these factors therefore drag these women workers into deprivation, trapping them in the unending circle of poverty.

The Statement of the Problems: Women workers in India are facing multifarious problems since long. The picture of exploitation in various employment sectors for women is more or less similar in nature. Various studies to reveal the exploitation scenario of women workers has been conducted so far in various corners of India. A thorough review of such studies would help us to get into the types and impacts of such exploitations.

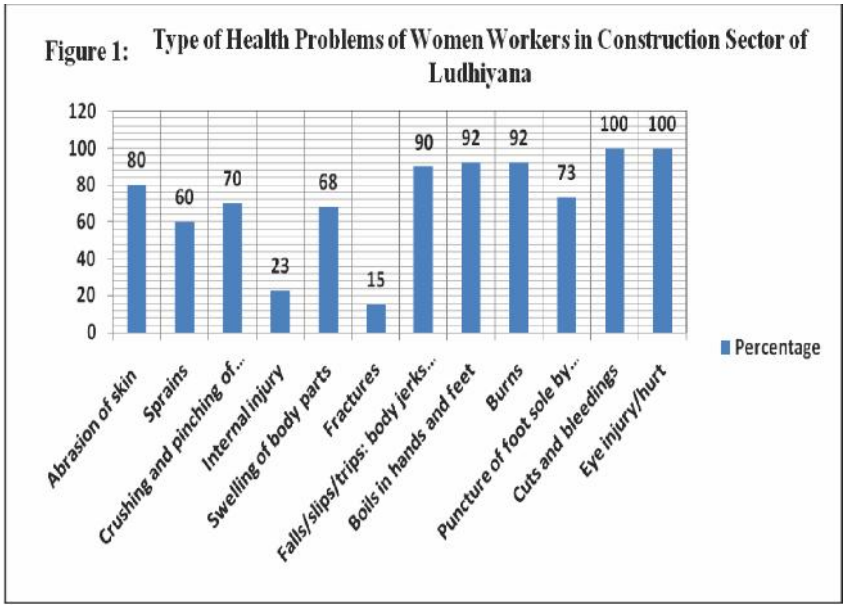
(a) Absence of skills and lack of opportunities for skill up-gradation

This problem is undoubtedly predominant in nature in almost all of the industries. As per Government of India (2008) in Construction sector the maximum women workers are unskilled. They perform various unskilled jobs like cleaning of construction sites, carrying bricks, mortar and water etc. Irrespective of the duration of years they worked, they are not upgraded from unskilled to skilled like the male workers (Jhabvala & Kanbur, 2002; Baruah, 2008, cited by Kalpanadevi & Kiran, 2013). A negative mindset of the employers works behind this problem where the capacity and potentials of the women workers are believed to be inferior to men. As a result they remain maximum vulnerable to health hazards and accidents. A study on women workers in various

unorganized sectors in Hariyana by Dr. Dave in 2012 found out that 76% of women workers did not have professional skills. Dhaatri Resource Centre for Women and Children and Samata (2010) in their handbook also reflect the same problem among women workers of mining industries.

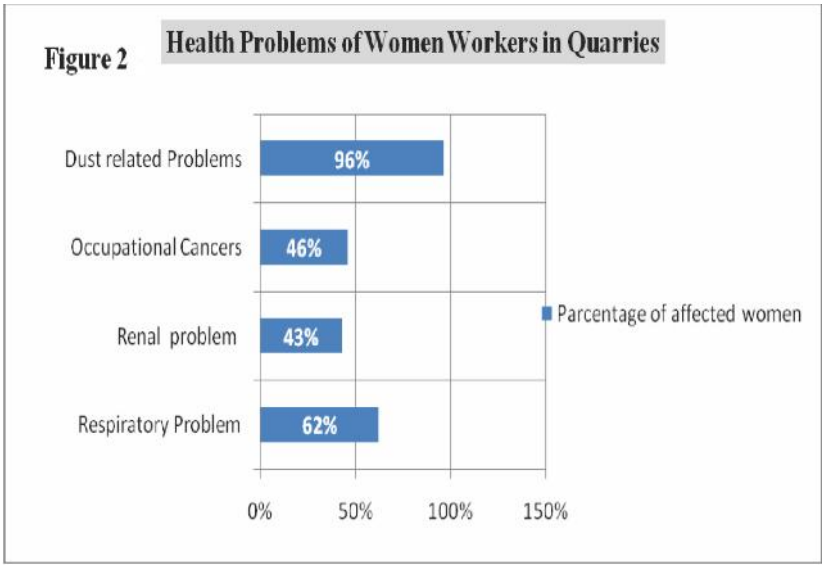
(b) Health Hazards and Injuries

As it is said atop, the women workers in Construction sector are much vulnerable to health hazards, accidents and injuries as they do not have the technical skill to protect themselves from such casualties. A study conducted among 80 women workers of construction sector in Ludhiyana by Bharara, Sandhu and Sidhu (2012) the reality regarding health problems due to their working condition has been exposed which is much shocking undoubtedly. The following figure is representing the said scenario:



Here we can find that women workers in construction industry in Ludhiyana are maximum vulnerable to cuts and bleedings as well as eye injury. Almost 90% of them suffer from burns, falls and slips from heights and boils in hands and feet due to hazardous works. Problems like fractures and internal injuries are also reported. Though low in rate but in between almost 15% to 20% which cannot be ignored at all. This survey also reflects that almost 48% of women workers who are suffering from burn have a history of the same in past. Similarly 33% of women who suffer from fall and slips from heights experienced the same accidents in last few months and more than 50 % of the women having incidents of cuts, bleedings and eye injuries had a frequent history of the same problems. 'Dhaatri Resource Centre for Women and Children and Samata (2010) reports for tuberculosis, silicosis, respiratory illness, skin infections, reproductive health problems, diarrhoea, malaria, hepatitis as predominant health

problems among women workers in mining industries. A study by Sivanesan (2013) on women workers on cashew industries of Kanyakumarika district shows that 37.35% of the respondents are affected by skin disease, almost 17% are affected by asthma and 13.35 % are suffering from tuberculosis. Another study on migrant women workers in selected quarries of Tamil Nadu by Srinivasan and Ilango (2013) implies that 56% of the respondents seem to be affected by all kinds of skin diseases. Skin related problems occur because of scorching sunrays when the women work in the quarry. 34% of them also suffered from sunstroke during their work in quarries due to lack of protection from direct sunrays. The next figure clears the overall scenario of health hazards of women workers in quarries under the aforesaid study area:



The 87 % of women workers in quarries also reported for psychological problems like stress due to the working environment. The components within working environment responsible for the health problems of the women there, are reflected through the following figure below.

Most alarming thing is the existence of radiation as a reason behind health problems for women workers there. The percentage is not negligible. Therefore strong measures must be taken by the government, employers and other active stakeholders here to protect the women workers from the deadly effect of radiation because the figure 2.1 shows the existence of occupational cancer among 46% of the respondents which is shocking undoubtedly. Looking at the study report by Thomas (2011) on *'Health Problems of Women working in a Textile Unit in Coimbatore'* it can be understood that the health status of women worker in textile industries is not much different than the other industrial sectors. 60% of the women workers in the said mills reported about the injuries at the work place. Eyestrain was a common problem in the said workplace and 45% of them had eye problems.

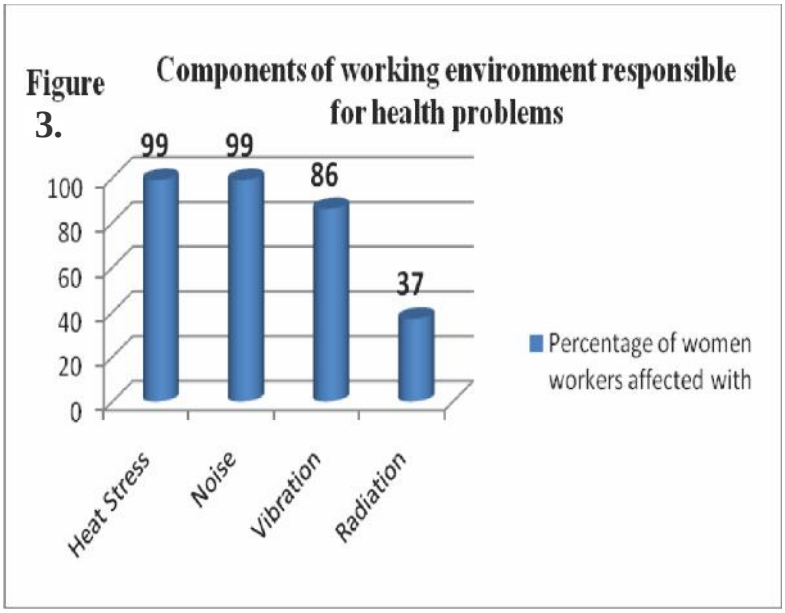


Figure 3.

Dust, heat and noise were reported as the worst occupational hazards in the textile mills. In the blow-room where the cotton bales were opened and cleaned the dust level was very high which led to the increase of asthma and respiratory problems among the respondents. 30% of the women workers in the mill were affected by asthma while 18% had other respiratory problems. 70% of the women were found with back pain due to long working hours.

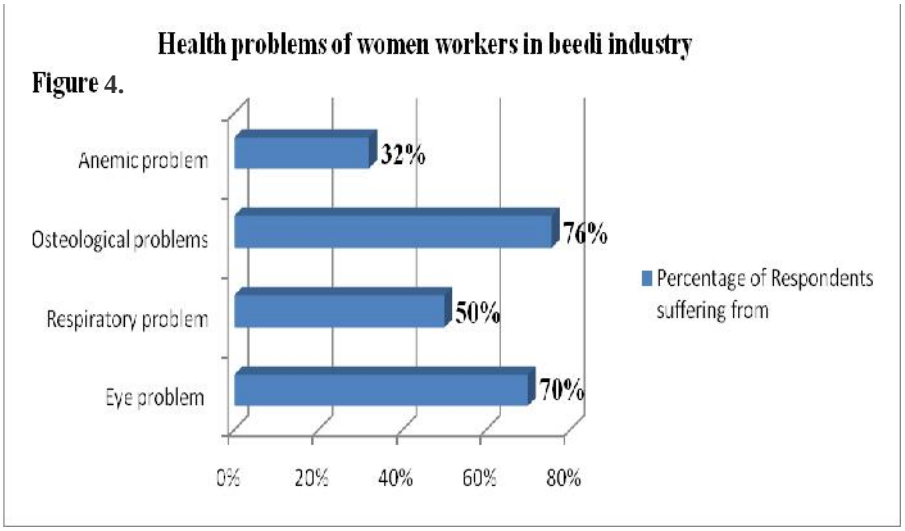


Figure 4.

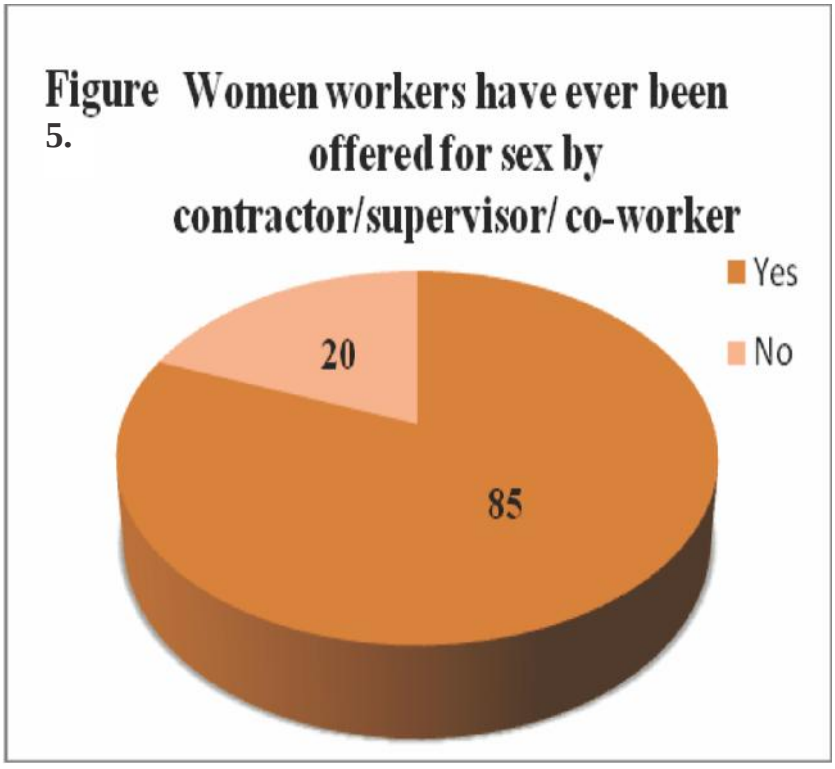
Beedi industry in India is such a sector where majority of the workers are women. This is amongst one of the sectors where health hazards are very high. Kumar and

Bharathi (2010) in their study on Occupational health hazards of Women Beedi Rollers in Tamilnadu, expose the harsh reality of sufferings of women workers in this sector. The next figure represents the scenario.

It is found shocking that, 92% of the sick women beedi rollers here can not avail medical consultation or checkup. The study report also reveals that 92% of the women are not at all sensitized that their health problems are caused by nicotine. Regarding the working environment of the women beedi rollers the study says that 41% of them don't have proper day-light facility, 44% of them don't have a proper ventilation facility at their work place and almost 50% of them suffer from natural forces like, thunder, lightning, heat and rain.

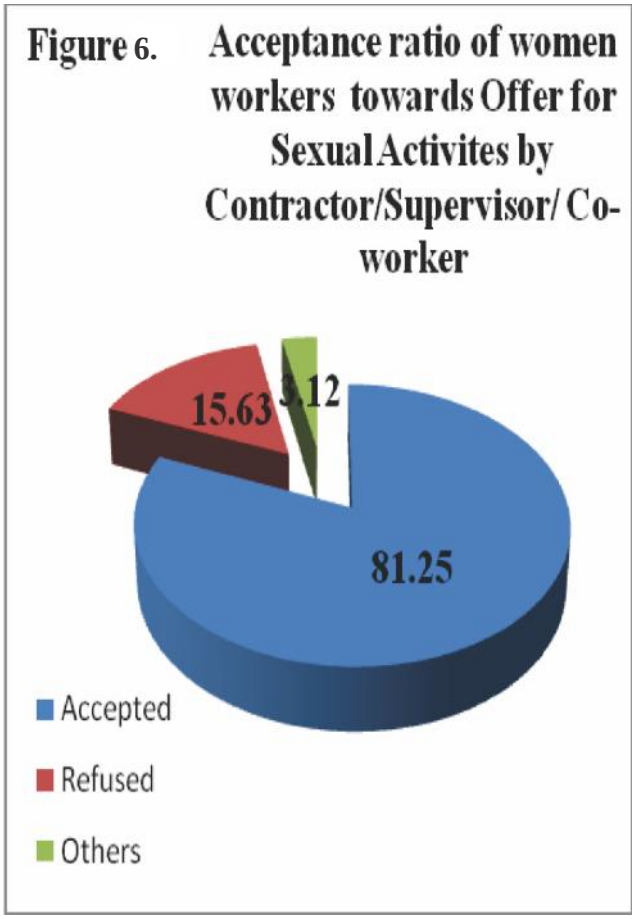
(c) Sexual Exploitations

This problem is a very serious one in case of different industrial sectors worldwide and India is not an exception. Rather it may be explained that due to poor rate of literacy, lack of job security, poverty and domination of male workforce in the workplaces in India, sexual harassment rates are maximum predominant here. The example of construction sector may be brought out.



Different studies reveal that insecure nature of employment, particularly for women, creates a vicious trap in which women are forced to please their supervisors or

contractors in order to sustain with their work. It is seen that the majority of women in this industry are from young age group of 18-40 years who have maximum chances to be exploited sexually at workplaces.



In their study with the women workers in Construction sector, Kalpanadevi & Kiran, (2013) found that 74% of respondents of different studies have been exploited sexually in the workplaces. Another Questionnaire Survey in Kolkata (2011-12) [cited by Rai and Sarkar (2012)] it is found that more than 75% of women workers in construction sector face the problem of sexual harassment in their workplace by their male co-workers or supervisors. The survey also reports that near about 85% of the respondents have been offered for sexual activities by their contractors or supervisors or co-workers and most shockingly it is found that 81% of them have accepted the offer. Figure 5 and 6 above reflect the said incidents.

Two case examples of two women workers of construction sectors at Behala and Dhakuriya in Kolkata have also been mentioned by Rai and Sarkar (2012) where the one said *"Thekedars and employer usually prefer to employ younger women whom they*

*may exploit sexually."*Another stated that she got employment in return of forcing some other poor young girls to please contractors for which the contractors promised her to provide regular employment opportunity and 20% of extra commission on her wage for next whole year. It is also found that only about 19% of the respondents who have been sexually harassed have reported the incidents to their higher authority for justice but surprisingly about 60% of them have got negative responses in return. A survey by Sakshi (Delhi) with women workers found some annoying data where 80% of their respondents accepted the existence of sexual Harassments in their workplaces among whom 49% encountered the same and 41% directly experienced the sufferings (Patel 2005). 17% of working women in major cities of India have admitted the existence of sexual harassment in workplaces. A survey done by Oxfam India and the social and rural research institute in 2011-2012 showed that high incidence of sexual harassment taking place in both organized and unorganized sectors in India not only in physical molestation but in non- physical aspects like teasing, obscene jokes and remarks and inappropriate touching in body parts etc. (Swarnalatha 2013). The said study was conducted in Delhi, Mumbai, Bangalore, Chennai, Kolkata, Ahmedabad, Lucknow and Durgapur which also found that women as daily labours, domestic help workers and workers in small scale units were maximum vulnerable to sexual harassments in their working places. The next figure reflects the findings, sector wise.

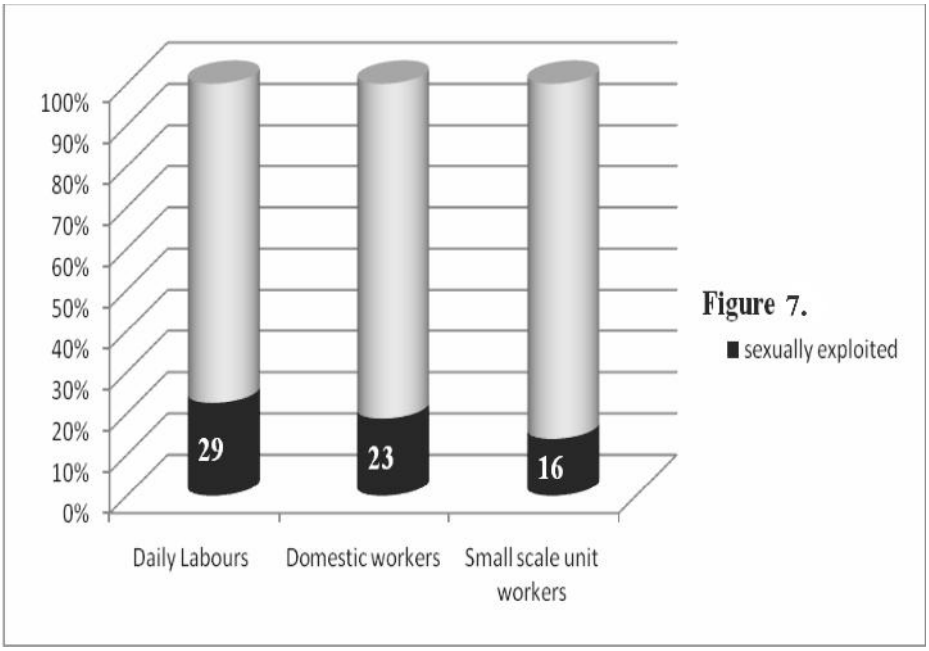
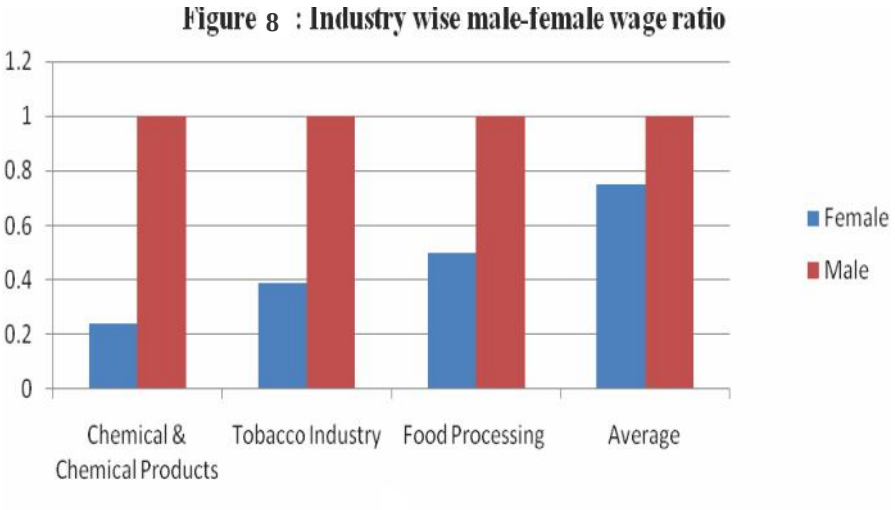


Figure 7.

(d) Wage Discrimination

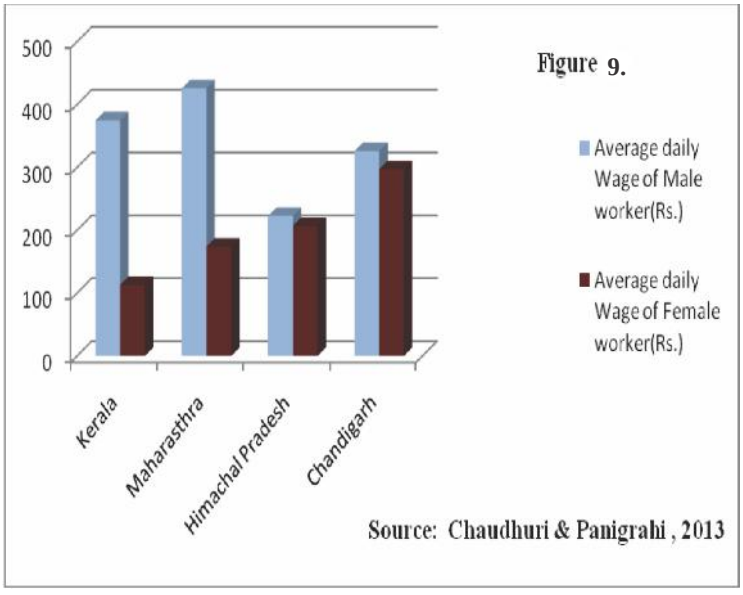
This is also a countrywide well spread problem for women workers. The female workers throughout India are getting on an average 48% lesser wages than male

(Chaudhuri & Panigrahi 2013). As per their review the industry wise wage ratio between male and female workers are reflected in the next figure,



From the figure it could be understood that though the women workers throughout all the industries in India are getting on an average 25% less wages than men but in Chemical and Chemical product industries they are almost 75% lagging behind. Though the participation of women workers in Tobacco industry is significantly higher than men (Almost 59%) but women workers in this sector are getting 60% lesser wage than men.

Wage Discrimination Scenario (State Wise)



In case of Food Processing industries though this craft is mastered by women in India but in case of wages they receive 50% lesser than their male co-workers. There are enough evidences in India where the women are being paid less than men for same work. One study shows that many large companies are subcontracting work to small factories and home based workers and the women workers here are earning merely ₹ 500 per month, whereas the minimum wage is fixed to ₹ 1500 for the same job and a regular worker in a large private sector factory could earn at least ₹ 3000 for the same (SEWA Report). It means, the women workers in the subcontracting industry are deprived in terms of getting approximately 90% lesser payment than the actual level of pay for the same work. Wage discrimination for women is more or less common problem in almost every state of India. The average wage discrimination scenario of some of the progressive states of India is as follows.

In Kerala the wage disparity is higher where the average daily wage of female workers is almost 30% of average daily wage of male. In Maharashtra it is 40% only. The scenario of both Himachal Pradesh and Chandigarh is comparatively much satisfactory where the women workers get on an average 8.5% lesser daily wage than men. Similarly the scenario of Andhra Pradesh, Karnataka and Tamil Nadu regarding average wage discrimination is higher (Almost 70%) like Kerala and Maharasthra whereas Punjab, Haryana, Delhi, Manipur, West Bengal and Jammu & Kashmir hold better position like Chandigarh and HP. Ironically it can be seen that the state like Kerala and Maharashtra where the female participation in work is higher the wage discrimination ratio is also very high (Chaudhuri & Panigrahi, 2013). The following table would prove the same in case of Kerala.

Table 1.

Industry	Average Female Workers Engaged	Wage discrimination ratio
Food processing	90%	0.45
Wearing Apparel	76%	0.54
Chemical, Pharmaceuticals etc.	43%	0.40

Source: Chaudhuri & Panigrahi, 2013.

In case of Haryana though the wage discrimination ratio is comparatively lower but it has been found that in respect to several sectors like construction, agriculture etc. almost 66% of the women workers face the problem of Wage discrimination among whom at least 55% get 20% lesser wage than men and 24% receive 30% lesser wage (Dave 2012). In case of Construction sectors in Mumbai it is reported that the contractors usually pay 20% lesser wage to female workers than the male for similar workload and in Patna the women workers get almost 50% less wage than men (Kalpanadevi & Kiran 2013).

(e) Lack of Social Security

Social Security is one of the basic human rights. But the women workers in India are also getting victimized in this regard. Dave (2012), in her study on women workers in several unorganized sectors in Haryana exposes a very alarming scenario in terms of availability of social security measures. The next figure reflects the same.

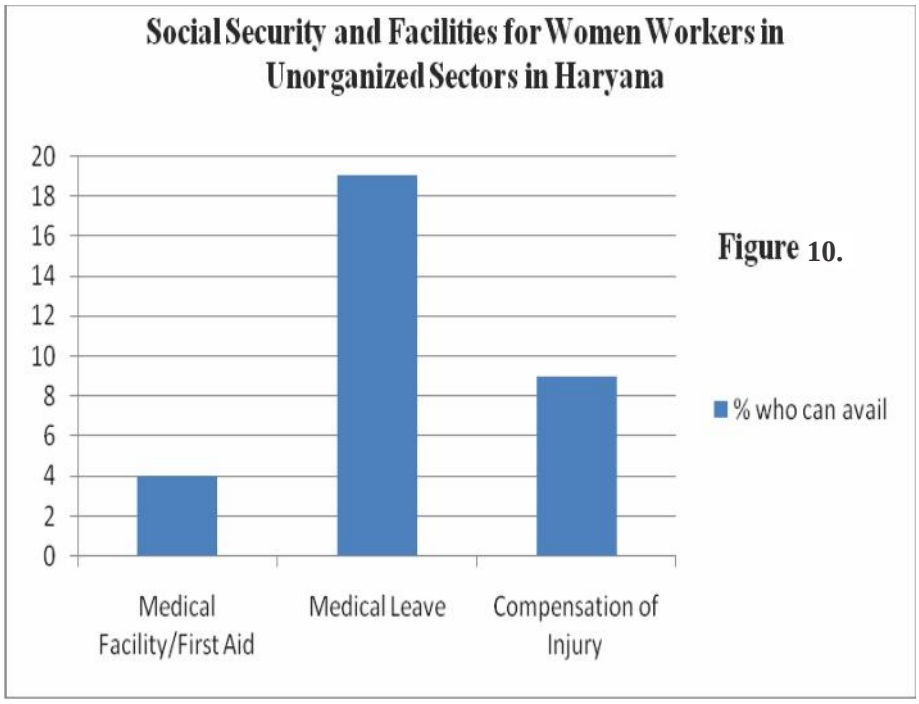


Figure 10.

Here we can see that less than 5% among the respondents get medical benefits or first aids in their workplaces and less than 10% get compensations for accidental injuries during work. The study reflects that though the domestic workers get medical leave but in other unorganized sectors there are no provisions for the same. The figure shows, less than 20% of the total respondents get the facility of medical leave. Very surprisingly no respondent (0%) gets the facility of Day Care for their children during working hours. In case of Mines it is found that only 1% of the total women workers have permanent employment. Women are often lowered to the mine pit with ropes or have to climb down without any support and stay at the mine site for 8–12 hours without any toilets or shelter facility (D R C WC & Samata, 2010). In another study on women workers from construction sectors in Kolkata (2011-12) about 60 % of respondents complain about insecure and hazardous working conditions and absence of social security measures like accidental benefits, medical treatment facilities etc. Majority of the respondents here also report for absence of retirement benefits for older women, facilities to skill up-gradation for alternative source of income, insurance,

pension etc. 80% of respondents report that they do not have proper facility of drinking water at workplace or if available not so safe for intake. This study indicates that 0% of the respondents get Maternity Leave. The majority of the women there do not get their rights in terms of crèche facility for their babies in job site. Some cases are also found where the women workers are forced to leave their babies on ground floor uncared and climb multiple floors of the high-rises carrying bricks or mortars.

These pictures are unquestionably shocking and indicate the gap in our socio-legal system to protect the rights of women in their workplaces. This is a very crucial issue for the comprehensive socio-economic development of our country. Before seeking out the remedies it is therefore necessary to find out the reasons behind the aforesaid problems

Reasons behind: Analysis of all the aforesaid problems may lead to several crucial yet widespread reasons which are as follows:

(i) *Gender Biasness:* Gender biasness leads to such mentality which tends to think that women are less efficient than men. This mentality is well exhibited in Industrial sectors in India. The employers with such mentality perceive that, by giving employment they are doing some favour to the women workers though it is found that in many cases the women workers are more dedicated and hard working. The same mentality also works among the male co-workers as a reason they tend to perceive that their capacity and importance for the job is superior to women. As a result the women workers do not get equal opportunity for training and capacity building, face sexual harassment not only from the employers but from the male co-workers, receive much lesser compensation for the same job and above all get negative responses or ignorance from the authority for any complaint they make, against exploitation.

(ii) *Illiteracy:* A study made in Haryana on Women workers in several sectors (2012) finds that 60% of the respondents do not have minimum literacy level. In case of both rural and urban areas in India almost 59.9% working women stay under minimum literacy level [NCEUS 2009a (Tables 4.2 and 4.8) cited by Klaveren et. all 2010]. Illiteracy among the women workers throughout India is responsible for their poor consciousness and sensitization level about their rights and opportunities. The exploiters take the advantage of such situation and exploit them continuously in terms of low wage, absence of social security, physical and sexual harassments etc.

(iii) *Poor sensitization about rights and opportunities:* As discussed before illiteracy is the root cause of ignorance and poor sensitization but poor sensitization level of women workers in India regarding their rights and opportunities itself becomes a major cause behind their exploitation. A study on Female Workers in Maharashtra by Yugantar Education Society, Nagpur (1997) reveals that almost 83% of their respondents do not have any knowledge of the Supreme Court Guidelines for preventing sexual harassment of women at work-places. In a

study on Women Workers in Construction Industry by Dr Karhad (2014, p. 836) it is stated also that though Government has made several laws and guiding principles for the financial and social security of women workers in the informal sectors but the workers are unfortunately not aware of the laws and regulations that seek to protect them.

(iv) *Poverty:* Like all other crucial social problems in India, poverty is also one of the unavoidable causes behind the problems facing by women workers in different sectors. Poverty forces poor women to avail jobs even at the cost of socio-economical and physical exploitations. A study in unorganized sectors of Haryana (2012) revealed that 52% of the women in unorganized sectors needed job due to poverty. Another study (2011-12) in Kolkata, as stated before, revealed that the women workers in construction sectors in Kolkata and surroundings tolerate the sexual and other exploitations to secure their daily jobs. The scenario is almost similar in other parts of the country. Poverty forces the poor women to get into jobs with even insufferable working conditions, discrimination and exploitations at work. Poverty stops them to raise their voices against exploitations in workplaces in fear of losing jobs.

The Remedies Recommended: As the problems have multifarious causes behind, therefore comprehensive strategies are required to combat them. As like the problems and their causes the remedies must be interlinked. Keeping the same in mind a comprehensive remedy structure is being proposed here which is also reflected in the Figure 11, below. The women commissions at all levels, trade unions, associations of business and industrial houses, their members, NGOs/VOs/CBOs and government of all level would be included as major stake holders in this structure. The structure proposes an intensive and expert monitoring over the conditions, problems and demands of the women workers along with need and skill gap identification for them from the part of the trade unions and women commissions. Helping the women workers for collective bargaining and make proper advocacy for placing their needs before their employers are also proposed to be done by the trade unions and women commissions.

It is also entrusted to them to report and recommend for proper interventions to both the government and the associations of business and industrial houses against the cases of discrimination, violation of rights and exploitations. On the basis of the aforesaid report and recommendation the government would also enforce the business/industrial associations to make it mandatory for their members for protection of rights, prevention of exploitation and discriminations as well as to arrange for welfare and development measures for the women workers. They will have to provide positive feedbacks to their members on the basis of recommendations of government and other stakeholders to ensure their effective functioning in this regard. If their members delay the same they would take punishment measures for their members. If the associations do not take active measures in this regard the governments would take legal steps against them and if it is done properly the governments would give positive reinforcement

also. Here it is also recommended for the government to create funds or trusts for the welfare and development of the women workers and make it mandatory for the business association and their members to contribute to these funds.

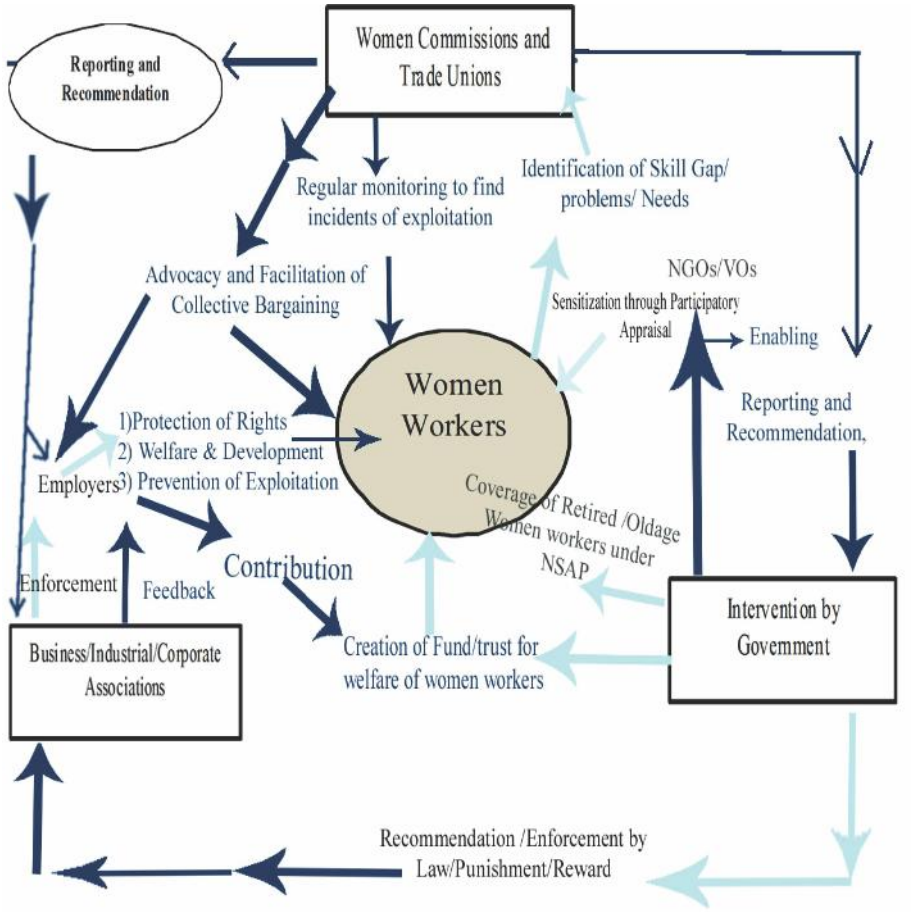


Figure 11: Recommended Model for Remedies against the problems of Women Workers

As per this model the government would have to make proper arrangement to cover the old age and retired women workers under National Social Assistance Programme (NSAP). On the basis of identified skill gaps and needs of the women workers government would enable the NGOs/VOs/CBOs to arrange for skill training for them as well as the NGOs/VOs/CBOs would be recommended from the government to arrange for the sensitization and awareness of the women workers about their resources and rights using the techniques of participatory appraisal, community organization, social group work etc. In this ways this model of remedy would be helpful to ensure comprehensive solution against the problems and exploitations of women workers.

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Herbal Herbicide: A Potential Tool of Weed Management for Rural Farmers

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Abstract

Weeds cause huge crop losses than any other crop pests. The modern approach to tackle them is the usage of chemical herbicides. As a consequence of worldwide growing concern about the environmental aspects of selected herbicides along with their untimely availability, high cost, etc., the need for the use of easily available and degradable herbicides is greater than ever. Herbal herbicides appear to be a useful option, especially for the farmers of rural areas. These herbal herbicides in judicious combination with other weed management tactics would be a potential tool for combating weed problems in agriculture.

Keywords: *Crop losses, herbal herbicide, weed management*

Introduction

Weeds have been a problem since man first began to cultivate crops. Estimates showed that the average annual yield losses due to various crop pests in India were valued at about 60,000 crores of rupees (Singh, 2005), out of which weeds alone accounted for the maximum loss (Table 1). Unfortunately, the damage on crops by weeds is invisible as compared to other pests. Farmers appreciate weeds as a problem only when it goes out of hand or when they seriously affect agricultural operations such as harvesting (e.g. spiny weeds). In addition to direct effect on crop yield, weeds result in considerable reduction in the efficiency of inputs used. The precious and costly inputs such as fertilizers and irrigation water, which are otherwise meant for realizing the potential yield, are usurped by the weeds (Yaduraju and Mishra, 2005).

Table 1. Annual losses caused by various pests in India

Pests	Loss (%)	Value (Rs. in crores)
Weeds	33	19,800
Diseases (Pathogens)	26	15,600
Insects	26	15,600
Rodents and others	15	9,000
Total	**100**	**60,000**

The progressive modernization of Indian agriculture involving intensive use of chemical herbicides to control weeds is gaining importance in recent years. A fundamental reason for the widespread use of chemical herbicides in modern agriculture is their ability to control selectively a wide range of weeds in a variety of crops and in some situations where all other methods fail or cannot be adopted. But the exclusive reliance on herbicide chemicals has led to concerns about contamination of environment by the presence of herbicide residue in soil, water and plants, particularly vegetables and fruits; threats to human health; toxicity to animals; shift in weed flora; and appearance of resistant weed species (Hatzios, 1987; Mukhopadhyay, 1992 and 1993; Gautam and Mishra, 1995; Duary, 2010). Innovative approaches are, therefore, needed to manage weeds effectively while eliminating or averting such concerns.

Sustainable agricultural systems dictate that inputs currently provided by non-renewable petrochemical resources should be replaced by biologically based renewable and naturally available inputs. To make weed management technologies sustainable and eco-friendly, it therefore needs to have a strategic shift from the use of chemical herbicides to that of herbal herbicides i.e. phytochemicals having herbicidal properties.

Concept of Herbal Herbicide

There are many plants in and around our environment. Some of these are having allelopathic effects. Still there are a variety of plants, which are not grazed, browsed, nibbled or relished by other means by herbivores or even infested by insects and infected by pathogens.

Some of such plants have medicinal/aromatic, cosmetic, preservative, repellent, antibiotic, empirical remedial/nutra-ceutical and other properties. Either whole or parts of those plants are having herbicidal as well as other properties. Such plants release some active chemicals (Mandal and De, 2001; Mandal *et al*., 2002) into the environment by exudation, leaching or decomposition (Kumar and Varshney, 2009) or excrete attractants (water/alcohol soluble products) that prevent germination and growth of almost all types of annual weeds both in transplanted and direct sown crops in anaerobic and aerobic soils. These bioactive molecules/phytochemicals or extracts of plant origin having herbicidal properties are called as herbal herbicides or phytoherbicides. Some examples of such plants are presented in Table 2.

Table 2. Plant sources having herbicidal properties

Sl. No.	Scientific name	Common name	Family	Salient features
1.	*Acacia auriculiformis*	Sonajhuri	Fabaceae	Evergreen tree
2.	*Adhatoda vasica*	Vasaka	Acanthaceae	Small evergreen, sub-herbacious bush
3.	*Ailanthus altissima*	Tree of heaven	Simaroubaceae	Deciduous tree
4.	*Andrographis paniculata*	Kalmagha	Acanthaceae	Annual herbaceous plant
5.	*Annona squamosa*	Ata	Annonaceae	**S**mall, well-branched tree or shrub
6.	*Antigonon leptopus*	Sandwich island climber / Anantalata	Polygonaceae	Flowering plant
7.	*Azadirachta indica*	Neem	Meliaceae	Tree
8.	*Calotropis gigantea*	Akand	Apocynaceae	Large shrub or small tree
9.	*Cassia tora*	Sickle pod	Caesalpinaceae	Annual leguminous weed
10.	*Cymbopogon citratus*	Lemon grass	Poaceae	Fast growing, perennial aromatic grass
11.	*Eucalyptus* sp.	Eucalyptus	Myrtaceae	Large tree
12.	*Holarrhena antidysentarica*	Kurchi	Apocynaceae	Medicinal herb
13.	*Ipomoea batatus*	Sweet potato	Convolvulaceae	Dicotyledonous plant
14.	*I. carnea*	Ban kalmi	Convolvulaceae	Vine
15.	*Peumus boldus*	Chilean plant	Monimiaceae	Evergreen tree
16.	*Tabarnaemontana coronaria*	Siulicop	Apocynaceae	Medicinal plant
17.	*Tagetes erecta*	Mexican marigold	Asteraceae	Annual plant
18.	*T. patula*	French marigold	Asteraceae	Annual plant
19.	*Vitex negundo*	Nisinda	Lamiaceae	Large aromatic shrub

Mode of Application

In general, green leaves at 150-200 kg ha^{-1} may be chopped, macerated and incorporated into the soil at the time of final puddling in transplanted rice or land preparation in other crops (Mandal and De, 2005; Mandal *et al*., 2002). Pre-emergence spray application of the herbal extract (aqueous/water extract) of *Calotropis* stem and leaf at 50 ml l^{-1} followed by two rounds of cono weeding can be effective for weed management under the System of Rice Intensification (SRI) during wet season (Bhowmick *et al*., 2014).

However, the dose and time of application on the usage of herbal herbicides need to be standardized for different crops.

Bio-efficacy Studies-A Review

Role of phytoherbicides as substitutes of chemical herbicides was discussed by De and De (2000). However, some findings on bio-efficacy of phytoherbicides or herbal herbicides have been presented hereunder.

Some phytoherbicides could effectively reduce both the density and dry weight of weeds at 15 days after transplanting (DAT) of *kharif* rice. Out of these, *Calotropis* was the second best in reducing weed dry weight and it was found significantly superior to mechanical weeding (30 DAT), *Ipomoea* and *Antigonon*. So far as grain yield was concerned, *Annona* yielded the highest, followed by *Vitex* and *Holarrhena* which were significantly superior to *Azadirachta*, pretilachlor and *Adhatoda*. Mechanical weeding was equivalent to *Adhatoda* and weed free treatments. *Calotropis*, *Ipomoea* and *Antigonon* were less effective in producing higher grain yield of rice (De and De, 2000).

Bhowmick *et al*. (2014) studied for improving rice productivity through weed management under SRI during wet (*kharif*) season. They recorded the highest grain yield under one hand weeding at 15 DAT supplemented with two times cono weeding (25 and 35 DAT), which was, however, comparable with pre-emergence (PE) application of pretilachlor 50 EC (500 g ha^{-1}) at 1 DAT + two times cono weeding (25 and 35 DAT) and use of herbal extract (water extract of *Calotropis* stem and leaf at 50 ml l^{-1}) at 1 DAT (PE) + two times cono weeding (25 and 35 DAT). Higher grain yields under these treatments might be due to effective weed suppression, improved soil aeration and more proliferation of rice roots, leading to more production of effective tillers in comparison to the others (farmers' practice, two and three times cono weeding). Thus, they suggested an integrated approach involving mechanical (cono) weeding supplemented with manual (hand) weeding, chemical herbicide (pretilachlor) or herbal herbicide (*Calotropis*) for sustainable weed management towards attaining improved rice productivity in SRI.

Furthermore, Mandal and De (2001), and Mandal *et al*. (2002) recorded minimum weed population at 42 DAT in weed free check which was equivalent with *I. batatus*, *Vitex*, mechanical weeding (30 DAT) and *Cymbopogon*. These were succeeded by *Calotropis* and *Annona* which were significantly superior to butachlor. *Antigonon*, *Adhatoda*, *Tabarnaemontana* and *Holarrhena* were moderate, and *Eucalyptus* was the least efficient in reducing weed population and was equivalent with unweeded control. *Vitex* recorded minimum weed dry weight and was found at par with weed free check and mechanical weeding. It was also found superior to butachlor. *I. batatus* and *Calotropis* reduced weed dry weight equally as good as butachlor, and were followed by *Cymbopogon* and *Annona*. Similar results of *Annona* were reported by De and De (2000).

Grain yield was augmented by *Vitex* with annidation effect over and above better weed control. Next best treatments were *I. batatas*, *Calotropis*, *Annona* and *Cymbopogon*, all being superior to butachlor. These were ensued by *Azadirachta* and *Holarrhena* that were more efficient than mechanical weeding. *Eucalyptus* might have

some amensalism effect on crop plant probably due to release of phytotoxic products after its decomposition, which was not reflected on weeds at early stage but became apparent on crop plants at subsequent stages (Mandal and De, 2001).

Mandal and De (2005) reported pre-emergence application of pretilachlor at 1.25 kg ha^{-1} to be the best in reducing population and biomass of weeds in rapeseed and the next best was mechanical weeding at 20 and 40 days after sowing (DAS). This was ensued by pre-emergence application of extracts obtained from 200 kg ha^{-1} of green leaves of *Tabernaemontana coronaria*. Among the herbal substances, *Tabernaemontana* proved to be the best with 34% yield advantage and ranked overall second top in net return, whereas *Holarrhena* and *Antigonon* provided net returns exceeding mechanical control. Therefore, herbal materials like *Tabernaemontana*, *Holarrhena* and *Antigonon* might replace traditional method of mechanical weed management in rapeseed.

Nagaraja and Deshmukh (2009) studied the phytotoxic effect of *Andrographis paniculata* (King of Bitter/Kirata/Kalmagha) on growth and metabolism of Congress grass (*Parthenium hysterophous*). They reported that the powered leaves, stems and roots of *Andrographis* could adversly affect the growth and physiology of *Parthenium* upto 60 DAS and hence, *Andrographis* might be a suitable herbal herbicide against *Parthenium*.

A field experiment was conducted to find out a suitable practice for the management of *Parthenium* using different bio-agents including Mexican beetle (*Zygogramma bicolorata*) @ 35 nos. $plant^{-1}$, sowing of Mexican marigold (*Tagetes erecta*) along with *Parthenium* in 50 : 50 proportion, sowing of sickle pod (*Cassia tora*) in 50 : 50 proportion, and inoculation of Brinjal Mosaic Virus (BMV). The beetle insect and BMV did not show much success whereas *C. tora* and *T. erecta* were found effective to significantly minimize weed population and growth possibly with the release of allelochemicals. Considering widespread availability of sickle pod and marigold, these plants might be useful to the common people for taking care of the obnoxious weed *Parthenium* (Dolai *et al*., 2015). Pawar *et al.* (2010) reported that *P. hysterophorus* intensity was lowered in association with the plant species *C. tora* and *T. erecta*. Ramachandra Prasad *et al*. (2010) reported that the French marigold (*T. patula* L.) did not allow *Parthenium* to grow with it.

Essential oil of *Peumus boldus* at all concentrations of 0.125-1.000 µl ml^{-1} was found to be the most phytotoxic against annual weeds such as *Amaranthus hybridus* and *Portulaca oleracea* by inhibiting their seed germination and seedling growth whereas that of *Drimys winterii* only affected germination of *Portulaca* at the highest concentration (0.5-1.0 µl ml^{-1}). The results, thus, suggested the possible use of essential oil from *P. boldus* as a natural herbicide for weed management in tropical and subtropical crops (Verdeguer *et al*., 2011).

The allelopathic potential of certain weed and crop species can influence the growth and distribution of associated weeds and the yield of desired plants (Inderjit and Keating, 1999). *Ailanthus altissima* produces an allelopathic chemical, called ailanthone, which inhibits the growth of other plants (Anon., 2014a) like garden cress (*Lepidium sativum*),

redroot pigweed (*Amaranthus retroflexus*), yellow bristlegrass (*Setaria pumila*), barnyard grass (*Echinochloa crusgalli*), pea (*Pisum sativum* cv. Sugar Snap) and maize (*Zea mays* cv. Silver Queen).

Extensive research in last few decades has demonstrated that several plant secondary metabolites (allelochemicals) possess good herbicidal activity. These allelochemicals provide us with novel chemistries that can be manipulated in order to produce commercial herbicides (Bhowmick and Mandal, 2001). Some examples of commercially developed herbicides (based on natural chemistry) are 'Cinmethylin' (a herbicidal analogue of 'cineole', widespread in plants), 'Benzazin' (based on the natural product 'benzoxazinones'/'hydroxamic acids' derived from poaceaeous plants), 'Quinclorac' (based on 'quinolinic acid' from *Nicotiana tabacum*), etc. One more important example is leptospermone, which is a purported thermochemical in lemon bottlebrush (*Callistemon citrinus*). Although it was found to be too weak as a commercial herbicide, a chemical analog of it, mesotrione (trade name Callisto), was found to be effective. It is sold to control broadleaf weeds in corn but also seems to be an effective control for crabgrass in lawns. Corn gluten meal (CGM) is used for natural pre-emergence weed control in turfgrass, which reduces germination of many broadleaved weeds and grasses (Anon., 2014b).

These examples demonstrate that the structures of naturally occurring phytotoxins can serve as leads for the synthesis of new successful herbicides. Thus, the secondary metabolites of plant species with allelopathic activities offer an excellent potential to develop new herbicide formulations or as a guide towards identifying active compounds to obtain natural/herbal herbicides.

More attempts need to be made to study the effect of plant-derived compounds or allelopathic effect of phytochemicals for identifying them as herbal herbicides. Till then, the commonly available plants may be utilized directly by the rural farmers for successful weed management in different crops and cropping systems.

Advantages

The utilization of herbal herbicides in weed management would have the following advantages:

1. They do not necessarily have effect on non-target organisms including human being.
2. Less chance of development of resistant weeds.
3. There is no residue build up in the environment.
4. They are easily degradable.
5. Other than herbicidal activity, they may act as plant growth promoters.
6. Being available in nature, rural farmers can easily utilize them.
7. Low cost technology for weed management.

Disadvantages

Despite having many advantages, herbal herbicides have following disadvantages:

1. Suppression or killing of weeds may be a slow process.
2. Efficacy under field conditions may be dependent on soil and environmental conditions. Sometimes, herbal herbicides may show very little or no toxicity when applied to soil.
3. To be effective, it may be required for bulk application.
4. Numerous phytoherbicides need to be discovered and developed.
5. Integration with chemical pesticides and cultural practices is required for enhanced broad-spectrum control of weeds.

Conclusion

Crop losses due to weeds are still very large and can result in significant financial burdens for farmers. Though chemical weeding effectively reduces the crop-weed competition and improves the farm labour efficiency, it involves substantial costs, including environmental pollution, threats to human health, and growing dependence on purchased input. Due emphasis, therefore, needs to be given for utilizing non-chemical methods of weed management starting from maneuvering of crop cultivation systems to biological methods along with the efforts to develop/identify and use of herbal herbicides. Recent advances in plant biochemistry have stimulated scientific interest into the possible role of secondary plant products as natural/herbal herbicides. Rural farmers can easily utilize such type of natural plant sources as herbal herbicides which may or may not control all types of weeds. As such, these cannot presently be considered as alternatives to broad-spectrum chemical herbicides and other weed control tactics, but should be considered as complementary adjuncts in Integrated Weed Management (IWM) system. Such an IWM practice involving herbal herbicides along with other tactics in judicious combination would be a cost-effective *vis-a-vis* eco-friendly remedy to the weed problems in agriculture.

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6

Biomass Fuel as an Important Correlate of Childhood Morbidity and under-nutrition in India

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Abstract

The present study investigates the role of indoor air pollution in elevating the risk of acute respiratory infection or chronic under-nutrition (i.e. stunting) among children in India. An attempt has been made to find out differences in ARI or stunting related to worse living environment controlling for socioeconomic, socio-religious, demographic, and spatial factors. Using data from National Family Health Survey-3 (2005-06), the present study found percentage prevalence of ARI and stunting among children under the age of five was high cutting across socioeconomic class, location and other attributes. In all 9% children were suffering from ARI fifteen days preceding the survey and above 40% children were stunted. Use of biomass fuel increases the risk of ARI and use of any unprocessed fuel makes them more susceptible to moderate or severe stunting. Reporting of ailment was lower among children of illiterate mothers and backward socio-religious communities, for girls, children with smaller size at birth, higher birth order and who lives in rural area. Living in worse environment along with poverty, related vulnerabilities increases the risk of stunting among children reducing their potential productive capacity. Widespread adoption of cleaner fuel is required to lessen the impact of indoor air pollution on child health and stunting.

Introduction

Caused by using solid fuel, indoor air pollution is a major public health threat in the developing world (Duflo *et al.*, 2008). It increases the risk of acute respiratory infection that is responsible for 20 percent of fatalities among children and leading cause of child mortality in the world (World Health Organization (WHO, 2002). It is worth noting that the use of solid fuel for cooking is the second-most environmental cause for disease

and fourth most important cause of excess mortality in the developing countries after malnutrition, unsafe sex and water-borne diseases (Bruce *et al.,* 2006). It was estimated that some 400–550 thousand premature deaths could be attributed annually to the use of biomass fuels (Smith, 2000). Using a disability adjusted life year (DALY) approach it was also estimated that 4–6 percent of the Indian national burden of disease has been attributed to indoor air pollution (ibid.).

Use of biomass fuel for cooking, heating and lighting increases the risk of chronic obstructive pulmonary diseases (COPD), acute respiratory infections (ARI) in childhood, and some of the significant causes for child deaths under the age of five (Bruce et al., 2000). Several studies in different developing countries have established the link between use of unprocessed solid fuel and ARI and quantified the relative risk of ARI among children in the households who use biomass (Armstrong and Campbell, 1991, Campbell, 1997, Cerqueiro *et al.,* 1990, Collings *et al.,* 1990, De Francisco *et al.,* 1993, Ezzati and Kammen, 2001, Johnson and Aderele, 1992, Kossove, 1982, Mtango *et al.,* 1992, O'Dempsey *et al.,* 1996, Pandey *et al.,* 1989, Shah *et al.,* 1994, Victora *et al.,* 1994). Moreover, a number of evidences were also available regarding the association between indoor air pollution and adverse pregnancy outcomes such as spontaneous abortion and low birth weight (Ghosh, 2006). Low birth weight causes malnutrition among children under the age of five (Boy *et al.,* 2002, Smith *et al.,* 2004, Ghosh, 2006).

Approximately half the world's population and 90 percent of rural households in the developing countries use unprocessed biomass fuel like animal dung, wood or crop residue for cooking (Smith, 1999). It is one of the 'poverty syndrome' factors which contribute to health inequality in developing countries (Wagstaff et al., 2004). However, limited works have been undertaken to explore the association between indoor air pollution and child health incorporating poverty related various confounding factors and demands more in-depth research and documentation.

Against this backdrop the present study would like to explore the linkage between indoor air pollution and ARI as well as chronic childhood under-nutrition represented by stunting in India. The logic behind the selection of two indicators — ARI and stunting – is that during last one and half decades the association between ARI and indoor air pollution has remained a major concern and is also one of the major contributors to stunting i.e. it affects both short-term and long-term health outcomes among children in the developing countries, especially in India.

Data and Methods

Data for this study were drawn from India's third National Family Health Survey (NHFS-3). It was carried out as part of the Demographic and Health Survey (DHS) programme during 2005-6. The survey was coordinated by the International Institute for Population Sciences (IIPS), Mumbai, under aegis of the Government of India. It covered a nationally representative stratified random sample of 38,748 children under the age group 0-5 years, residing in 109,041 households. The objective of the survey was to provide estimates of wide range of demographic, socioeconomic and nutritional

health and other health status indicators. The survey covers 99 percent of India's population living in all the states. The child file of NFHS-3 has been used for the analysis of the data. NFHS-3 has collected information from 51, 555 children. However, the present analysis was restricted to 38,748 children for whom the data regarding stunting were available.

The main strata used in the sampling procedure were rural and urban areas. The primary sampling units (PSUs) (villages in the rural areas and census enumeration blocks in urban areas) were selected with probability proportional to size sampling. The households were selected from within the PSUs. The non-response was not different according to background characteristics for mothers and it had not caused any bias in the data.

Response Variable

The response variables of the present study were whether the child was suffering from ARI and chronic childhood under-nutrition. The variable whether child was suffering from ARI was created from two separate variables – first, whether child was suffering from cough and second, whether it was accompanied by short and rapid breathing during last fifteen days preceding the survey. ARI is a binary variable with '0' indicating that the child was not suffering from ARI while '1' indicating that the child was suffering from ARI. Chronic childhood under-nutrition represented by stunting was created from height for age Z score of children compared to the WHO reference population of 2006. Stunting is a categorical variable with category '1' representing severely undernourished (whose Z score was below -3 standard deviation of the median value of the reference population), '2' representing moderately undernourished children (whose Z score was below-2 standard deviation of the median value of the reference population).

Predictor variables

The predictor variables used here to test their significant association with ARI and stunting, are described below. Their construction was constructed based on earlier studies related to the determinants of childhood illness and under-nutrition among children (UNICEF, 1998). Indicator of indoor air pollution was created from nature of fuel used for cooking and heating in the household. It is a categorical variable with four categories– use of electricity or gas, indoor use of biomass fuel, use of coal or charcoal and outdoor cooking with open fire. "Crowding" is an important variable in the present analysis as it has implications for personal hygiene and transmission of disease. Crowding of members within a household was created from two separate variables - number of household members and number of rooms available in a household for sleeping. Here crowding was measured as the number of persons per room. Further, it was grouped into two categories: less than or equal to three persons per room and greater than three persons per room. The socio-religious and cultural aspects of households were captured through a combination of variables representing religion and caste (categorized as:

forward caste Hindu, other backward caste (OBC) Hindu, scheduled caste (SC) Hindu and scheduled tribe (ST) Hindu, Muslims and other minorities). Type of family is another covariate incorporated in the study with two categories – nuclear family and non-nuclear family.

Educational attainment of mothers was incorporated as a single categorical variable to assess the relative effect of mother's education on childhood ailment and nutritional status (categories were illiterate, attained less than or equal to middle school and attained more than middle school). In addition to mother's educational attainment, her nutritional status was also incorporated, which was created from Body Mass Index (BMI) score. Mothers were classified as undernourished if BMI was found to be less than 18.50 kg/m^2, normally nourished if BMI lie between 18.50 and 24.99 kg/m^2 and overweight if BMI was 25.00 kg/m^2 and above. Mother's age was classified into two groups- 15-19 and 20 & above. Mother's anaemia is one of the crucial variables indicating mother's health status and thus included in the analysis (the categories were no anaemia, mild anaemia and severe to moderate anaemia).

Child level characteristics included in the analysis were sex, age, birth order, size of the child at birth and child's anaemia. Child's age was categorized into three groups– 0-11 months, 12-23 months and 24 and above. Birth order has three categories – first order, second to third order and 4 and above. Size of the child at birth was included as a proxy of birth weight (three categories were - large, average and small). Child's anaemia was categorized in a similar way as that of the mother.

Location of residence (rural-urban) and region of residence (northern, central, eastern, north-eastern, western and southern) were included as categorical variables to capture the spatial influence. Northern states were Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, and Uttaranchal; states from the central region were Chhattisgarh, Madhya Pradesh and Uttar Pradesh; eastern states were Bihar, Jharkhand, Orissa, and West Bengal; north-eastern states were Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura; western states were Goa, Gujarat, and Maharashtra; and southern states were Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu.

Analytical model

Since the outcome variable is binary in nature, multivariate binary logistic regression technique was used to explore the influence of indoor air pollution on ARI. Another outcome variable 'stunting' was also a categorical variable (however, more than two categories) and thus the association between indoor air pollution and stunting was explored using multinomial logistic regression model.

Overall ten models were estimated, five for each of the outcome variable. Model 1 includes only indoor air pollution variable to test the hypothesis – exposure to indoor air pollution worsens child health outcomes. In successive models, other characteristics of household, mother, child, and spatial characteristics were included to see, first, whether these factors influence common childhood ailment and long-term nutritional

deprivation and secondly, whether use of biomass fuel for cooking and heating inside house has significant influence on ARI and nutritional status even after controlling a number of confounding covariates. In other words, it allows the identification of factors that reduced the significance of the variable of interest in each model, hence enabling the identification of variables that are associated with use of biomass fuel and ARI as well as with long-term nutritional deprivation.

Data were analysed using Stata Release 11. Descriptive statistics were produced to describe sample characteristics of the study population in Table 1. Bivariate analysis was performed in order to understand the prevalence of ARI and stunting by socioeconomic, demographic and spatial variables and presented in Table 2. Variations in morbidity (Table 3) and under-nutrition (Table 4 and Table 5), according to demographic, socioeconomic and spatial characteristics were captured through multivariate analysis. The odds ratios and relative risk ratios produced by multivariate binary logit and multinomial logit regressions respectively were used for interpretation.

Results

Sample characteristics of children

Table 1: Sample characteristics of children under the age of five in India (2005-06)

	N	%
Indoor air pollution		
Electricity, LPG	10,350	26.7
Indoor biomass	22,696	58.6
Coal, charcoal etc.	2,185	5.6
Outdoor biomass	3,517	9.1
Socio-economic status		
Poor asset quintile	12,777	33.4
Middle asset quintile	12,751	33.3
Higher asset quintile	12,759	33.3
Crowding		
< 3 members live in a room	14,605	37.7
>=3 members live in a room	24,097	62.3
Socio-religious and cultural group		
Forward class Hindu	7,491	20.2
ST Hindu	2,658	7.2
OBC Hindu	10,016	27.0
SC Hindu	6,127	16.5
Muslim and other minorities	10,842	29.2

Family structure		
Nuclear	18,647	48.1
Non-nuclear	20,101	51.9
Mother's education		
Illiterate	15,701	40.5
<Middle School	8,872	22.9
>=Middle School	14,175	36.6
Mother's nutritional status		
Underweight	12,646	32.8
Normal	22,136	57.4
Overweight	3,753	9.7
Mother's age		
15-19 years	19,692	50.8
20 & above	19,056	49.2
Mother's anaemia		
No anaemia	15,418	42.4
Mild anaemia	14,397	39.6
Moderate to severe anaemia	6,521	18.0
Child's anaemia		
No anaemia	11,563	35.7
Mild anaemia	8,467	26.2
Moderate to severe anaemia	12,320	38.1
Sex of the child		
Boy	20,147	52.0
Girl	18,601	48.0
Child's age		
0-11 months	6,783	17.5
12-23 months	7,748	20.0
24 & above	24,217	62.5
Size of the child at birth		
Large	8,758	23.0
Average	21,811	57.2
Small	7,569	19.9
Birth order		
First order	11,834	30.5
2-3	17,481	45.1
4+	9,433	24.3

Place of residence		
Urban	14,407	37.2
Rural	24,341	62.8
Region of residence		
Northern	6,029	15.6
Central	9,531	24.6
Eastern	6,304	16.3
North eastern	7,541	19.5
Western	4,123	10.6
South	5,220	13.5

Source: NFHS III

Table 1 represents sample characteristics of the children and tries to depict a picture of the sampled children. Here we observed that about three out of five children were exposed to indoor air pollution caused by using solid fuel within household. It was also found that more than 60 percent were crowded, only 20 percent belonged to forward caste Hindu and 52 percent were non-nuclear households. In the sample, 41 percent mothers were found to be illiterate, 33 percent were undernourished, 51 percent belonged to 15-19 year age group and almost 60 percent were found to be anaemic. It was also observed that majority of the sampled children were more than two years of age and nearly half of them were of second or third birth order, 64 percent of children were anaemic, 20 percent children were of small size at the time of birth and 63 percent live in the rural areas.

Differences in the prevalence of ARI and stunting (moderate and severe) among children by background characteristics

Table 2: Percentage of children suffered from ARI last fifteen days preceding the survey and prevalence of severe and moderate stunting among children under the age of five in 2005-06

	% suffered from ARI		% below -3SD		% between -3SD & -2SD	
Indoor air pollution	**N**	**%**	**N**	**%**	**N**	**%**
Electricity, LPG	767	7.4	1,124	10.9	1,919	18.5
Indoor biomass	2,305	10.2	5,743	25.3	5,758	25.4
Coal, charcoal etc.	181	8.3	396	18.1	548	25.1
Outdoor biomass	249	7.1	761	21.6	806	22.9
Socio-economic status						
Poor asset quintile	1,260	9.9	3,942	30.9	3,245	25.4
Middle asset quintile	1,200	9.4	2,625	20.6	3,233	25.4
Higher asset quintile	987	7.7	1,370	10.7	2,446	19.2

Crowding						
< 3 members live in a room	1,342	9.2	2,201	15.1	3,046	20.9
>=3 members live in a room	2,158	9.0	5,813	24.1	5,971	24.8
Socio-religious and cultural group						
Forward class Hindu	663	8.9	951	12.7	1,597	21.3
ST Hindu	198	7.5	729	27.4	643	24.2
OBC Hindu	869	8.7	2,201	22.0	2,417	24.1
SC Hindu	578	9.4	1,570	25.6	1,584	25.9
Muslim and other minorities	980	9.0	2,325	21.4	2,408	22.2
Family structure						
Nuclear	1,688	9.1	4,335	23.3	4,486	24.1
Non-nuclear	1,814	9.0	3,689	18.4	4,545	22.6
Mother's education						
Illiterate	1,399	8.9	4,693	29.9	3,937	25.1
<Middle School	894	10.1	1,808	20.4	2,242	25.3
> = Middle School	1,209	9.0	1,523	10.7	2,852	20.1
Mother's nutritional status						
Underweight	1,248	9.9	3,188	25.2	3,298	26.1
Normal	1,962	8.9	4,374	19.8	5,016	22.7
Overweight	271	7.2	403	10.7	680	18.1
Mother's age						
15-19 years			5,003	25.4	4,982	25.3
20 & above			3,021	15.9	4,049	21.3
Mother's anaemia						
No anaemia			2,889	18.7	3,511	22.8
Mild anaemia			3,009	20.9	3,446	23.9
Moderate to severe anaemia			1,652	25.3	1,588	24.4
Child's anaemia						
No anaemia			1,670	14.4	2,659	23.0
Mild anaemia			1,749	20.7	2,158	25.5
Moderate to severe anaemia			3,669	29.8	3,193	25.9
Sex of the child						
Boy	1,878	9.3	4,276	21.2	4,684	23.3
Girl	1,624	8.7	3,748	20.2	4,347	23.4
Child's age						
0-11 months	818	12.1	652	9.6	878	12.9
12-23 months	836	10.8	1,767	22.8	1,934	25.0
24 & above	1,848	7.6	5,605	23.1	6,219	25.7

Size of the child at birth						
Contd.						
Large	822	9.4	1,577	18.0	1,916	21.9
Average	1,784	8.2	4,404	20.2	4,988	22.9
Small	869	11.5	1,876	24.8	1,966	26.0
Birth order						
First order	1,077	9.1	1,770	15.0	2,557	21.6
2-3	1,608	9.2	3,457	19.8	4,228	24.2
4+	817	8.7	2,797	29.7	2,246	23.8
Place of residence						
Urban	1,215	8.4	2,298	16.0	3,067	21.3
Rural	2,287	9.4	5,726	23.5	5,964	24.5
Region of residence						
Northern	521	8.6	1,163	19.3	1,312	21.8
Central	844	8.9	2,610	27.4	2,292	24.1
Eastern	840	13.3	1,393	22.1	1,602	25.4
North eastern	654	8.7	1,362	18.1	1,673	22.2
Western	366	8.9	757	18.4	1,028	24.9
South	277	5.3	739	14.2	1,124	21.5
Total	**3,502**	**9.0**	**8,024**	**20.7**	**9,031**	**23.3**

Reporting of ARI was observed to be higher among children who were more exposed to indoor air pollution (10.2 percent), belonging to poorer households (9.9 percent) and scheduled caste Hindu community (9.4 percent), living in nuclear households (9.1 percent). It was also found to be higher among children of educated mothers (10.1 percent among those children whose mothers attended lower than middle school and 9 percent where mothers were educated more than eight standard) and undernourished (9.9 percent). The prevalence of ARI was also found to be higher among boys (9.3 percent), younger children (12 percent among 0-11 months old children), low birth weight children (11.5 percent), children of second or third birth order (9.2 percent). Moreover, such reporting was also higher among those children who live in the rural areas (9.4 percent). It may be noted that children living in the southern states substantially less likely to report such ailment compared to other states (5.3 percent).

Prevalence of stunting among children according to background characteristics was also depicted in the Table 2. Prevalence of severe stunting was found to be higher among children who were exposed to emission from biomass fuel (more than 20 percent), children belonging to poor and scheduled tribe households (31 percent and 27 percent respectively) and living in crowded households (24.1 percent). It was observed to be higher among those children whose mothers were illiterate (29.9 percent),

underweight (25.2 percent), younger in age (25.4 percent) and anaemic (25.3 percent of moderate to severely anaemic). The prevalence of stunting was higher among children who were anaemic (29.8 percent of moderate to severely anaemic), boys (21.2 percent), older children (more or less 23 percent), low birth weight (24.8 percent) and of higher order (29.7 percent). It was observed to be higher among children belonging to rural area (23.5 percent) and did not belong to the southern states.

Also, prevalence of moderate stunting was found to be higher among children who were more exposed to emission from unprocessed fuel in the households (more than 20 percent), children belonging to poor, scheduled caste and crowded households (25.4 percent, 25.9 percent and 24.8 percent respectively) (Table 2). It was also found to be higher among those children whose mothers were less literate (25 percent), underweight (26.1 percent), younger in age (25.3 percent) and anaemic (24.4 percent of moderate to severely anaemic). The prevalence of moderate stunting was observed to be higher among children who were anaemic (25.9 percent for moderate to severe anaemia), belonged to older ages (greater than 25 percent), had low birth weight (26.0 percent) and of second or third order (24.2 percent). As found earlier, the prevalence of moderate stunting was also higher among children who live in rural area (24.5 percent) and did not belong to the southern states.

Econometric analysis

The odds ratio of various background characteristics produced by binary logit regressions and relative risk ratio produced by multinomial logit regression analyses were presented in Table 3, 4 and 5. Interpretation of the Tables is discussed below.

Association between indoor air pollution and ARI among surveyed children

Table 3: Odds Ratio of logistic regression showing association between indoor air pollution and ARI occurrence among children controlling potential confounders

ARI	Model 1	Model 2	Model 3	Model 4	Model 5
Indoor air pollution					
Electricity/LPG (Ref.)	1.00	1.00	1.00	1.00	1.00
Indoor biomass	1.41*** (1.297-1.538)	1.33*** (1.192-1.489)	1.33*** (1.189-1.494)	1.32*** (1.179-1.484)	1.40*** (1.230-1.599)
Coal, charcoal etc.	1.13 (0.953-1.336)	1.08 (0.898-1.292)	1.08 (0.896-1.293)	1.06 (0.879-1.269)	0.96 (0.799-1.163)
Outdoor biomass	0.95 (0.821-1.104)	.83** (0.699-0.988)	.82** (0.689-0.977)	.83** (0.696-0.988)	1.00 (0.822-1.213)
Socio-economic status					
Poor asset quintile (Ref.)		1.00	1.00	1.00	1.00
Middle asset quintile		1.00 (0.909-1.091)	0.96 (0.872-1.055)	0.97 (0.878-1.065)	1.05 (0.947-1.157)
Higher asset quintile		.86** (0.765-0.972)	.83*** (0.734-0.950)	.85** (0.741-0.962)	0.93 (0.808-1.062)

Crowding				
<=3members per room (Ref.)	1.00	1.00	1.00	1.00
> 3 members per room	.90*** (0.833-0.974)	.92** (0.846-0.991)	0.94 (0.869-1.023)	0.97 (0.891-1.052)
Socio-religious and cultural group				
Forward class Hindu (Ref.)	1.00	1.00	1.00	1.00
ST Hindu	.72*** (0.603-0.853)	.73*** (0.615-0.870)	.73*** (0.612-0.870)	.77*** (0.648-0.926)
OBC Hindu	.91* (0.811-1.012)	.91* (0.810-1.012)	.91* (0.812-1.016)	0.99 (0.883-1.111)
SC Hindu	0.97 (0.860-1.103)	0.98 (0.867-1.113)	0.99 (0.870-1.119)	1.06 (0.936-1.207)
Muslim and other minorities	1.04 (0.930-1.156)	1.06 (0.950-1.182)	1.08 (0.963-1.201)	1.13** (1.005-1.265)
Family structure				
Nuclear family (Ref.)	1.00	1.00	1.00	1.00
Non-nuclear family	1.01 (0.935-1.088)	1.00 (0.925-1.077)	0.95 (0.879-1.029)	.93* (0.857-1.005)
Mother's education				
Illiterate (Ref.)		1.00	1.00	1.00
< Middle School		1.20*** (1.083-1.318)	1.17*** (1.056-1.290)	1. 20*** (1.081-1.324)
> = Middle School		1.15** (1.033-1.281)	1.11* (0.992-1.237)	1.17*** (1.044-1.308)
Mother's nutritional status				
Underweight (Ref.)		1.00	1.00	1.00
Normal		.92** (0.848-0.993)	0.94 (0.873-1.024)	0.96 (0.884-1.038)
Overweight		.81*** (0.696-0.940)	.86* (0.739-1.002)	0.92 (0.794-1.079)
Sex of the child				
Boy (Ref.)			1.00	1.00
Girl			.90*** (0.834-0.966)	.89*** (0.828-0.959)
Child's age 12-23 months (Ref.)			1.00	1.00
0-11 months			1.11*** (1.037-1.298)	1.11* (0.995-1.233)
24 & above			.68*** (0.622-0.745)	.68*** (0.619-0.741)
Size of the child at birth				
Average (Ref.)			1.00	1.00
Large			1.16*** (1.062-1.274)	1.15*** (1.050-1.262)
Small			1.41*** (1.290-1.545)	1.41*** (1.290-1.546)

Birth order					
First birth order (Ref.)				1.00	1.00
2-3				1.02	1.01
				(0.930-1.110)	(0.928-1.108)
4 & above				0.92	.88**
				(0.820-1.031)	(0.786-0.989)
Place of residence					
Child lives in urban area (Ref.)					1.00
Child lives in rural area					.88**
					(0.799-0.975)
Region of residence					
Southern (Ref.)					1.00
Central					1.79***
					(1.545-2.084)
Eastern					2.66***
					(2.290-3.112)
Northeastern					1.71***
					(1.440-2.019)
Western					1.84***
					(1.554-2.191)
Northern					1.62***
					(1.376-1.910)
Number of observations	38748	36717	36522	35978	35978
chi2	85.07	103.74	123.06	329.44	495.72
Probability> chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0037	0.0050	0.0060	0.0157	0.0242

Significance level: *p<.1, **p<.05, ***p<.01

Indoor air pollution is found to be one of the strongest predictors in explaining reporting of ARI in Model 1 and remained significant even after controlling all other potentially confounding factors in Model 5 (OR=1.40; 95% CI=1.230, 1.599). Although children belonging to the poorer households were significantly more likely to report ARI in the initial models (model 2, 3 & 4), its significance disappears after controlling for spatial heterogeneity in the model 5 (OR=0.93, 95% CI=0.808, 1.062). It is interesting to note that scheduled tribe children were significantly less likely to report ARI compared to the children from other socio-religious groups even after controlling for other confounders (OR=0.77, 95% CI= 0.648, 0.926). Living in non-nuclear families found to be a significant protective factor of ARI after controlling for spatial factors with other variables (OR=0.93, 95% CI=0.857, 1.005).

Among mother level features, higher educational attainment of mothers significantly increases the probability of reporting her child's illness even after controlling other confounders (1.20, 95% CI=1.081, 1.324, for less than middle school level education and OR=1.17, 95% CI=1.044, 1.308, for higher educational attainment). Although reporting of ARI was more likely to be lower among children of normal or overweight

mothers in the initial models, its significance disappears after controlling child level and spatial characteristics in the final model (model 5) (OR=0.96, 95% CI=0.884, 1.038, for normal weight mothers and OR=0.92, 95% CI=0.794, 1.079 for overweight mothers).

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for normal weight mothers and OR=0.92, 95% CI=0.794, 1.079 for overweight mothers).

Apart from household and mother level characteristics, child level factors were also found to be significantly associated with increased reporting from ARI even after controlling other potential confounders in model 5. Reporting of ARI was significantly lower among girls (OR=0.89, 95% CI=0.828-0.959) and decreased with age (OR=1.11, 95% CI=1.035, 1.295 for 0-11 months children; OR=0.68, 95% CI=0.619, 0.741 for 24 months and above). The reporting was also found to be higher among children who were not of normal weight at their birth (OR=1.41, 95% CI=1.290-1.546 for small size at birth, OR=1.15, 95% CI=1.050, 1.262 for large size at birth). The reporting of ARI was found to be lower for the children of higher birth order in the final model (Model 5) (OR=0.88, 95% CI=0.786, 0.989 for 4 or higher order children).

Spatial variables were found to be significant predictors of ARI even after controlling all other variables. It was found that rural children were significantly less likely to report ARI compared to their urban counterparts (OR=0.88, 95% CI= 0.799, 0.975). It was also observed that children living in the northern, central, eastern, north-eastern, and western regions were significantly more likely to report ARI compared to children living in southern states (model 5).

Association between indoor air pollution and severe stunting

Table 4: Relative Risk Ratio of multinomial logistic regression showing association between indoor air pollution and severe stunting occurrence among children controlling potential confounders

Normal vs. Severe stunting	Model 1	Model 2	Model 3	Model 4	Model 5
Indoor air pollution					
Electricity/LPG (Ref.)	1.00	1.00	1.00	1.00	1.00
Indoor biomass	3.33***	1.58***	1.26***	1.25***	1.31***
	(3.108-3.578)	(1.440-1.725)	(1.145-1.380)	(1.139-1.379)	(1.176-1.455)
Coal, charcoal etc.	2.07***	1.28***	1.06	1.07	1.16**
	(1.823-2.361)	(1.110-1.466)	(0.922-1.225)	(0.926-1.239)	(1.000-1.349)
Outdoor biomass	2.54***	1.25***	1.13*	1.08	1.40***
	(2.285-2.817)	(1.107-1.412)	(0.998-1.279)	(0.950-1.228)	(1.214-1.613)
Socio-economic status					
Poor asset quintile (Ref.)					
Middle asset		.65***	.77***	.77***	.76***
quintile		(0.608-0.694)	(0.721-0.828)	(0.716-0.826)	(0.704-0.816)
Higher asset		.36***	.52***	.50***	.46***
quintile		(0.325-0.391)	(0.470-0.573)	(0.449-0.550)	(0.413-0.512)

Crowding				
<=3members per room (Ref.)	1.00	1.00	1.00	1.00
> 3 members per room	1.48*** (1.392-1.571)	1.35*** (1.267-1.433)	1.26*** (1.184-1.348)	1.21*** (1.134-1.295)
Socio-religious and cultural group				
Forward class Hindu (Ref.)				
ST Hindu	1.44*** (1.276-1.628)	1.23*** (1.078-1.380)	1.25*** (1.101-1.422)	1.27*** (1.113-1.440)
OBC Hindu	1.46*** (1.331-1.591)	1.31*** (1.195-1.433)	1.33*** (1.210-1.457)	1.36*** (1.236-1.495)
SC Hindu	1.64*** (1.486-1.809)	1.46*** (1.320-1.611)	1.51*** (1.366-1.677)	1.54*** (1.388-1.708)
Muslim and other minorities	1.47*** (1.349-1.612)	1.35*** (1.232-1.476)	1.35*** (1.232-1.485)	1.46*** (1.323-1.600)
Family structure				
Nuclear family (Ref.)	1.00	1.00	1.00	1.00
Non-nuclear family	.88*** (0.834-0.934)	.91*** (0.864-0.968)	1.03 (0.974-1.098)	1.02 (0.958-1.081)
Mother's education				
Illiterate (Ref.)		1.00	1.00	1.00
< Middle School		.73*** (0.681-0.785)	.76*** (0.702-0.815)	.79*** (0.737-0.858)
> = Middle School		.48*** (0.442-0.523)	.51*** (0.469-0.559)	.54*** (0.497-0.594)
Mother's nutritional status				
Underweight (Ref.)		1.00	1.00	1.00
Normal		.83*** (0.780-0.878)	.83*** (0.778-0.879)	.83*** (0.783-0.885)
Overweight		.65*** (0.570-0.730)	.61*** (0.539-0.695)	.63*** (0.553-0.714)
Mother's age Contd.				
Mother is teen (Ref.)		1.00	1.00	1.00
Mother's age >=20 years		.82*** (0.777-0.875)	.86*** (0.812-0.918)	.87*** (0.813-0.920)
Sex of the child				
Boy (Ref.)			1.00	1.00
Girl			.90*** (0.853-0.956)	.90*** (0.853-0.956)
Child's age 12-23 months (Ref.)			1.00	1.00
0-11 months			.24*** (0.214-0.266)	.24*** (0.212-0.263)
24 & above			0.99 (0.921-1.060)	0.99 (0.924-1.064)

Size of the child at birth					
Average (Ref.)				1.00	1.00
Large				.87***	.91**
				(0.809-0.933)	(0.850-0.981)
Small				1.37***	1.40***
				(1.271-1.469)	(1.298-1.501)
Birth order					
First birth order (Ref.)				1.00	1.00
2-3				1.24***	1.23***
				(1.151-1.331)	(1.147-1.327)
4 & above				1.46***	1.40***
				(1.343-1.593)	(1.285-1.526)
Place of residence					
Child lives in urban area (Ref.)					1.00
Child lives in rural area					.89***
					(0.827-0.968)
Location of residence					
Southern (Ref.)					1.00
Central					1.88***
					(1.691-2.091)
Eastern					1.23***
					(1.098-1.382)
Northeastern					1.14**
					(1.007-1.282)
Western					1.72***
					(1.510-1.953)
Northern					1.45***
					(1.290-1.638)
Number of observations	38748	36717	36522	35978	35978
Chi2	1382.49	2457.15	2895.10	4061.86	4222.12
Probability> chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0198	0.0370	0.0445	0.0711	0.0746

Significance level: *p<.1, **p<.05, ***p<.01

Use of any type of unprocessed fuel for cooking and heating significantly increased the relative risk of severe stunting among children even after controlling for potential confounders in the model (Model 5) (RRR=1.31, 95% CI=1.176, 1.455, for indoor use of biomass fuel, RRR=1.16, 95% CI= 1.000, 1.349 for use of coal, charcoal etc, RRR=1.40, 95% CI= 1.214, 1.613, for outdoor use of biomass fuel) (Table 4). Children belonging to the affluent households were significantly less likely to be severely stunted compared to children from poor asset quintile in all the models (RRR= 0.76, 95% CI= 0.704, 0.816, for middle wealth quintile and RRR= 0.46, 95% CI= 0.413-0.512 for higher wealth quintile). Relative risk of severe stunting were significantly higher among children of crowded households (Model 5) (RRR=1.21, 95% CI= 1.134, 1.295). It may be observed that even after controlling for all the potential confounders, relative risk of stunting among every socio-religious groups was significantly higher compared to forward caste Hindu (RRR= 1.27, 95% CI= 1.113, 1.440 for ST Hindu, RRR= 1.36,

95% CI= 1.236, 1.495 for OBC Hindu, RRR= 1.54, 95% CI= 1.388, 1.708, RRR= 1.46, 95% CI= 1.323, 1.600 for Muslim and other minorities). Although the relative risk of severe stunting was found to be significantly higher for children belonging to nuclear family, its significance disappeared after controlling for child specific characteristics.

Children of illiterate mothers (RRR= 0.79, 95% CI= 0.737, 0.858 for mothers educated less than middle school level, RRR= 0.54, 95% CI= 0.497, 0.594, underweight mothers (RRR= 0.83, 95% CI= 0.783, 0.885 for normal weight mothers, RRR= 0.63, 95% CI= 0.553, 0.714 for overweight mothers), teenage mothers (RRR= 0.87, 95% CI = 0.813, 0.920 for older mothers) were found to be significantly vulnerable to severe stunting even after controlling for all the confounding factors in model 5.

Mild gender inequality disfavouring boys was found to exist in stunting (RRR=0.90, 95% CI=0.853-0.956). Moreover, stunting among children aged 0-11 months were found to be significantly lower compared to the children of older ages (RRR= 0.24, 95% CI= 0.212, 0.263 for children under the age of one). Further, children who were small in size at the time of birth (RRR= 1.40, 95% CI= 1.298, 1.501) and of higher birth order (RRR= 1.40, 95% CI= 1.285, 1.526) have significantly higher risk of severe stunting even in the final model (Model 5). It was observed that rural children were less likely to be severely stunted compared to urban children (RRR= 0.89, 95% CI= 0.827, 0.968). Moreover, the relative risk of severe stunting was found to be the lowest among children living in southern region compared to any other region.

Association between Indoor air Pollution and Moderate Stunting

Table 5: Relative Risk Ratio of multinomial logistic regression showing association between indoor air pollution and moderate stunting occurrence among children controlling potential confounders

Normal vs. Moderate stunting	Model 1	Model 2	Model 3	Model 4	Model 5
Indoor air pollution					
Electricity/LPG (Ref.)	1.00	1.00	1.00	1.00	1.00
Indoor biomass	1.96***	1.40***	1.27***	1.29***	1.32***
	(1.845-2.078)	(1.295-1.514)	(1.171-1.377)	(1.186-1.399)	(1.206-1.452)
Coal, charcoal etc.	1.68***	1.30***	1.19***	1.19***	1.21***
	(1.503-1.881)	(1.153-1.468)	(1.056-1.349)	(1.051-1.351)	(1.068-1.381)
Contd.					
Outdoor biomass	1.57***	1.17***	1.12**	1.11*	1.24***
	(1.429-1.733)	(1.049-1.315)	(1.002-1.260)	(0.984-1.243)	(1.092-1.411)
Socio-economic status					
Poor asset quintile (Ref.)		1.00	1.00	1.00	1.00
Middle asset quintile		.92***	0.98	0.97	0.98
		(0.859-0.979)	(0.920-1.054)	(0.904-1.040)	(0.910-1.051)
Higher asset quintile		.66***	.77***	.74***	.73***
		(0.602-0.713)	(0.705-0.847)	(0.675-0.813)	(0.665-0.808)

Crowding				
<=3members per room (Ref.)	1.00	1.00	1.00	1.00
> 3 members per room	1.27*** (1.203-1.343)	1.22*** (1.154-1.291)	1.18*** (1.112-1.250)	1.16*** (1.091-1.229)
Socio-religious and cultural group				
Forward Class Hindu (Ref.)	1.00	1.00	1.00	1.00
ST Hindu	1.06 (0.942-1.190)	0.98 (0.873-1.105)	1.00 (0.888-1.132)	1.00 (0.889-1.133)
OBC Hindu	1.13*** (1.044-1.218)	1.08* (0.995-1.162)	1.09** (1.005-1.178)	1.10** (1.019-1.198)
SC Hindu	1.24*** (1.136-1.354)	1.18*** (1.076-1.284)	1.21*** (1.109-1.329)	1.24*** (1.134-1.362)
Muslim and other minorities	1.04 (0.961-1.122)	1.01 (0.936-1.094)	1.04 (0.960-1.127)	1.08* (0.996-1.174)
Family structure				
Nuclear family (Ref.)	1.00	1.00	1.00	1.00
Non-nuclear family	.94** (0.891-0.990)	.95* (0.901-1.002)	1.03 (0.977-1.092)	1.02 (0.967-1.081)
Mother's education				
Illiterate (Ref.)		1.00	1.00	1.00
< Middle School		0.95 (0.890-1.023)	0.95 (0.886-1.084)	0.96 (0.895-1.037)
> = Middle School		.80*** (0.741-0.862)	.81*** (0.749-0.876)	.82*** (0.760-0.892)
Mother's nutritional status				
Underweight (Ref.)		1.00	1.00	1.00
Normal		.84*** (0.790-0.885)	.84*** (0.788-0.885)	.84*** (0.796-0.895)
Overweight		.72*** (0.650-0.800)	.68*** (0.615-0.760)	.70*** (0.630-0.780)
Mother's age				
Mother is teen (Ref.)		1.00	1.00	1.00
Mother's age >=20 years		.87*** (0.825-0.922)	.89*** (0.844-0.946)	. 90*** (0.848-0.952)
Sex of the child				
Boy (Ref.)			1.00	1.00
Girl			0.97 (0.917-1.019)	0.97 (0.916-1.018)
Child's age				
12-23 months (Ref.)			1.00	1.00
0-11 months			.32*** (0.294-0.355)	.32*** (0.293-0.354)
24 & above			1.04 (0.972-1.109)	1.04 (0.866-0.987)

Size of the child at birth					
Average (Ref.)				1.00	1.00
Large				.92*** (0.858-0.977)	.92** (1.203-1.380)
Contd.					
Small				1.28*** (1.195-1.371)	1.29*** (1.090-1.238)
Birth order					
First birth order (Ref.)				1.00	1.00
2-3				1.16*** (1.090-1.237)	1.16*** (1.013-1.196)
4 & above				1.12*** (1.030-1.215)	1.10** (0.898-1.036)
Place of residence					
Child lives in urban area (Ref.)					1.00
Child lives in rural area					0.96 (1.198-1.444)
Region of residence					
Southern (Ref.)					1.00
Central					1.32*** (1.050-1.284)
Eastern					1.16*** 0.960-1.182)
Northeastern					1.07 (1.282-1.593)
Western					1.43*** (0.981-1.206)
Northern					1.09
Number of observations	38748	36717	36522	35978	35978
Chi2	1382.49	2457.15	2895.10	4061.86	4222.12
Probability> chi2	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0198	0.0370	0.0445	0.0711	0.0746

Significance level: *p<.1, **p<.05, ***p<.01

The relative risk of moderate stunting was significantly higher among children belonging to households using any unprocessed fuel compared to cleaner fuels even controlling all other characteristics in the model 5 (RRR=1.32, 95% CI=1.206, 1.452, for indoor use of biomass fuel, RRR=1.21, 95% CI= 1.068, 1.381 for use of coal, charcoal etc, RRR=1.24, 95% CI= 1.092, 1.411, for outdoor use of biomass fuel). As seen on earlier occasions, children living in affluent households were significantly less likely to be stunted in contrast with children of poorer households (model 5) (RRR= 0.73, 95% CI= 0.665, 0.808) even after controlling other confounders. Children of crowded households were significantly at higher risk of stunting (RRR= 1.16, 95% CI= 1.091, 1.229) in all the models. It may be noted that not only the children of other backward castes and scheduled castes were significantly at higher risk of stunting but

also minorities were significantly at higher risk of stunting compared to the forward caste Hindu children in the final model (RRR= 1.10, 95% CI = 1.019, 1.198 for OBC, RRR= 1.24, 95% CI= 1.134, 1.362 for SC Hindu, RRR= 1.08, 95% CI = 0.996, 1.174 for Muslims and other minorities).

Children of illiterate mothers are more likely to be stunted in all the models (RRR= 0.82, 95% CI= 0.760, 0.892 for mothers whose educational attainment was middle school or more). Risk of stunting increases with mother's undernutrition and early child bearing in all the three models (RRR= 0.84, 95% CI = 0.796, 0.895 for mother's with normal BMI level, RRR= 0.90, 95% CI = 0.848, 0.952 for older mothers). As observed in earlier analyses, smaller size at birth and higher birth order significantly increase the risk of stunting among children which are found clearly in both model 4 and model 5 (RRR= 0.32, 95% CI= 0.293, 0.354 for children under the age of one, RRR= 1.29, 95% CI= 1.090, 1.238 for smaller size at birth, RRR= 1.10, 95% CI= 0.898, 1.036 for higher order children). Children living in the southern states were found to be markedly less vulnerable to stunting compared to the other parts of India in model 5.

Discussion

Based on the data collected by the National Family Health Survey-3, 2005-2006, the present study has made an attempt to draw a picture of acute and chronic health deterioration among children living in those households where they are exposed to indoor air pollution due to the emission from solid fuels used for cooking and heating. The present findings need to be interpreted in the light of the contexts of developing countries in general and of India in particular.

Although, in India, there has been an appreciable reduction of infant mortality rates, total fertility rate accompanied by spectacular increase in life expectancy during the last three decades or so, prevalence of childhood under-nutrition and common ailments have not been reduced at par (IIPS and Macro International, 2007).

Previous literatures established that poverty syndrome factors are highly responsible for slow reduction in childhood morbidity and under-nutrition (Heller and Drake, 1979, Smith and Haddad, 2000, Navaneetham and Josh, 2005, Taguri et al., 2008). It is not only the low income of the poor which affects their health and nutrition but they are also at a disadvantaged situation that contributes to poverty and low income and compel them to further impoverishment (Wagstaff et al., 2004). Living in unhealthy physical environment i.e. in crowded rooms, and depending on agricultural residues, wood, animal dung for cooking inside the room with or without a separate kitchen facility, cooking in open fire – all severely damage poor people's health (Smith, 1999, Powell *et al.,* 2001, Ghosh, 2006; Mishra and Rutherford, 2007). Evidences reflect that, prolonged exposure to indoor air pollution elevates the risk of pneumonia or ARI and low birth weight (Smith et al., 2000, Bruce *et al.,* 2000, Qian *et al.,* 2000, Boy *et al.,* 2002, Mishra *et al.,* 2004; Ghosh, 2006). Our hypothesis is established since we observed that the use of biomass fuels inside the households increases the probability of ARI and

also increases the risk of severe and moderate stunting even after controlling for other potential confounders as found in other previous studies (*ibid.*).

Along with the living environment of the household, other demographic, socioeconomic and spatial factors influence the susceptibility of children to under-nutrition and acute illnesses in the developing countries. It is interesting to observe that although children belonging to the scheduled tribe community were less likely to report the incidence of ARI, they were suffering from severe stunting compared to others. Similar observation holds good also for mother's educational attainment. Several explanations can be put forward for such observations. First, during the survey neither the children were clinically examined nor the mothers were given a precise definition of what constituted an episode of ARI. The questions which were asked in the survey measure a mother's perception of her child's health in place of any diagnosis emerging from a clinical profile. This has been termed by other researchers as 'self-professed illness measurement' (Murray and Chen, 1994; Ghosh, 2005; Ghosh and Bose, 2012). This may create variations in the reporting of illnesses among different socioeconomic groups because the perception of illness varies across different socioeconomic groups. Secondly, recall lapse as well as misinterpretation of the reference period can also contribute to the measurement of disease frequency (Ghosh, 2005; Ghosh and Bose, 2012; Gaminiratne, 1991). An alternative explanation is advanced by the theory of 'Positional Objectivity' (Sen, 1993). It states that "what we decide to believe is influenced by what we observe (Sen, 1993:145). However, data regarding stunting was anthropometrically measured and are obviously more accurate.

We observed that children belonging to the marginalized communities are severely undernourished, even after controlling for other proximal and underlying determinants. This higher level of severe under-nutrition among them is mainly due to higher incidence of ailments and inadequate health seeking, living in poor environment with improper hygiene practice, and improper feeding practice (Chakraborty, 2005, Ghosh and Kulkarni, 2004, Kanjilal *et al.*, 2010). All these factors potentially have a negative impact on their health outcome resulting in a high incidence of mortality among different other things. On the other hand, educated mothers are more likely to access healthcare for their children and those children are less likely to be undernourished even controlling for exposure to use of unprocessed fuels and crowding at home. Their probability of recurrent ailments and resulting under-nutrition gets reduced with higher social acceptability of healthcare (Basu, 1990, Linnemayr *et al.,* 2008, Peters *et al.*, 2008).

It was found that the use of solid fuel increases the risk of ARI among adults in Kenya (Ezzati and Kammen, 2001), while other studies found that higher risk of under-nutrition among women is associated with frequent illness and less access to healthcare (Chatterjee and Lambert, 1989). Arguably, children of undernourished mothers are more likely to have higher risk of stunting due to probability of intergenerational transfer of under-nutrition and have higher susceptibility of illness due to higher exposure to indoor pollution when they stay with their mother at home during time of cooking (Dharmalingam *et al.,* 2010). Therefore, it aggravates their suffering from respiratory infections; prolonged exposure and illness make them undernourished as found in

previous studies (Smith *et al.,* 2004). Early pregnancy is a major cause of childhood stunting as teenage mothers do not receive adequate nutritional intake during prenatal period and tend to deliver low birth weight babies (ibid.).

After controlling different poverty syndrome factors, results show that urban children are at an elevated risk of respiratory infections as well as severe stunting. However, it was presumed that, since most of the health indicators are worse for rural children, the vulnerability to be morbid and undernourished also would be higher among them compared to their urban counterpart. But our results support the earlier findings of Montgomery (2009), Fotso (2006) that poverty and ill health locus is shifting gradually from rural to urban area as visible especially in case of health and nutritional status of children of developing countries under the age of five. It also confirms the findings of many other studies regarding the nature and magnitude of urban poverty during the last two decades (Deaton and Dreze, 2002; Sen and Himanshu, 2004a, b; Chandrasekhar and Mukhopadhyay, 2007; Himanshu, 2007; Madhiwalla, 2007). The results of recent National Sample Surveys (NSSO) also indicate that the decline of poverty has been lower in urban areas compared to rural areas in India (NSSO, 2007). Lack of amenities and services such as potable drinking water and safe sanitation, drainage, solid waste collection and disposal and electricity are indicators of urban poverty (Laquian, 2004). These unhygienic conditions make urban poor children more susceptible to infectious diseases such as diarrhoea and ARI and growth retardation (Heller and Drake, 1979, Ghosh and Shah, 2004). The higher purchasing power of the rich drives up the prices of food and private health care goods, making them unaffordable for the poor though benefiting the rich (Ghosh, 2009). These result into inadequate feeding and underutilization of healthcare services which aggravates further deterioration (Ghosh and Bose, 2012). The impact of location of residence on stunting in India is evident in another study, where spatial heterogeneity is evident (Kanjilal *et al.*, 2010).

The region of residence was found to be a significant factor even after controlling all other variables. Except for children in southern India, the probability of contracting infectious childhood ailment like ARI and vulnerability to under-nutrition is clearly high in all other regions of the country and it is highest among children of the eastern region (in case of ARI) and central region (in case of severe stunting). Children of eastern region suffer more from infections because of distinct agro-climatic condition associated with the aetiology of this ailment as mentioned in previous study (Ghosh, 2005). In addition to ecological conditions, different levels of socio-economic development and ineffective public health service delivery reduce the accessibility to healthcare and prolongs the suffering (Ghosh, 2005, Peters *et al.,* 2002). In addition, the central region of India is considered as less developed in terms of general levels of educational attainment, macro-economic conditions, basic infrastructure like road networks and the availability as well as utilization of basic healthcare facilities, whereas the southern part is more developed in terms of those indicators as argued in other previous studies (Baru *et al.,* 2010, Ghosh, 2005). So, these factors could help to explain the emergence of severe under-nutrition differences among children who belong to these regions.

Conclusion

Recognizing the adverse health consequences of indoor air pollution among children one should note that the widespread adoption of cleaner fuel would help to reduce indoor air pollution. In India, however, poorer households rely on biomass fuel and are unlikely to switch to cleaner fuels due to lack of affordability. Since LPG is not available at a subsidized rate even for the rural poor masses in the recent times, government sponsored intervention programmes should encourage the traditional users to use energy efficient, less-polluting fuel such as *gobar* gas (gaseous fuel made from raw cow dung). It may also be noted that extending the LPG distribution network to such areas will not be cost-prohibitive as it has been argued by a study (TERI, 2010). The provision of more efficient and better ventilated cooking stoves (with chimney) or putting a window above the stove and allowing cross ventilation by opening the door during cooking time also can protect people from indoor air pollution and related morbidities. In conclusion, a diverse, inclusive approach that incorporates the local needs and realities in each region, yet embracing the common goal of climbing the clean energy ladder, will serve India well in the long run.

In addition to the above interventions, there are other demographic and socioeconomic covariates that are subject to intervention: backward caste children, less educated and undernourished teenage mothers, low birth weight children, offspring of urban poor, those who live in eastern and central region of India and so on. These factors are well-recognized for their strong influence on child health and survival. Along with this, there is need for qualitative studies to identify the unobserved behavioural and cultural factors contributing to worse health outcomes of children among various communities, especially at the regional level.

Nevertheless, the present study needs to be followed by carefully designed studies with better measures of smoke exposure. Such research is important because a large proportion of households in India and in other developing countries rely on biomass fuel for household energy and, under-nutrition as well as common childhood illnesses are well known risk factors for childhood ill health and premature death.

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7

Role and Status of Primary Education in India

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Abstract

With the advent of democratic republic and welfare state, *primary education is envisaged as a basic need of the citizens everywhere in the world. Without basic education, it was felt* democracy, socialism *and* welfarism would *become meaningless. In the post-World War-II era, Western European states adhered to liberal democracy with welfarist approach in their economic policy stances. As part of this welfare-centric economic policies, provision of primary education viz. universalisation of primary and basic education became one of the most important and significant policy agenda. Same is true about the erstwhile socialist countries– USSR, China and Eastern European block. In these countries too, their statist economic agenda laid great emphasis upon universalisation of primary and basic education. The countries which at that time were liberated from their colonial rule – the countries which were dubbed since then as the Third World – also put emphasis on basic and primary education. Especially those countries which could adopt and/or could continue with the liberal democratic form of governance influenced in this regard by the Western model of democracy. India after gaining independence from the colonial British rule in 1947 became one of the prominent members of the Third World camp, and inspired by the basic model of Western form of liberal democracy – particularly that of United Kingdom – adopted the ideal of liberal democratic state. At present, she is regarded as the largest representative democracy of the world where on regular basis as per the Constitution of the independent country government is elected by the people/citizens of the country through simple voting. Although education – particularly primary education was not rendered the status of Fundamental Right by the makers of Indian Constitution, it was mentioned in the Directive Principles of the State, which makes it as a duty of the Indian state to provide basic and primary education to all in the country. Literacy rate in India is very poor and further there is great inter-state divergence between the states and also, between the districts within a state in India in this regard. The plight of West Bengal is no exception although*

the state lies above the all India rate as far as literacy rate is concerned. Education is the qualitative indicator of development. Level of development can be judged in terms of extent of literacy rate In India, shortfall in pupil enrolment and retention, especially in rural areas, in urban slums and among girls and members of scheduled castes and tribes remains a severe challenge for a long time. Our feeling is that not only the quantity but also the quality of primary education need to be emphasised if the goal to create meaningful and capable human resources in this age of neo-liberal globalisation.

Introduction

With the advent of *democratic republic and welfare state,* primary education is envisaged as a basic need of the citizens everywhere in the world. Without basic education, it was felt *democracy, socialism* and *welfarism would* become meaningless. In the post-World War-II era, Western European states adhered to liberal democracy with welfarist approach in their economic policy stances. As part of this welfare-centric economic policies, provision of primary education viz. universalisation of primary and basic education became one of the most important and significant policy agenda. Same is true about the erstwhile socialist countries – USSR, China and Eastern European block. In these countries too, their statist economic agenda laid great emphasis upon universalisation of primary and basic education. The countries which at that time were liberated from their colonial rule – the countries which were dubbed since then as the Third World – also put emphasis on basic and primary education. Especially those countries which could adopt and/or could continue with the liberal democratic form of governance influenced in this regard by the Western model of democracy. Elementary education in India means eight years of schooling from the age of six. The 86th amendment to the Indian constitution made free and compulsory education a fundamental right for all children in the age group 6 to 14 years (Chandrasekhar, Mukhopadhyay, 2006).

India after gaining independence from the colonial British rule in 1947 became one of the prominent members of the Third World camp, and inspired by the basic model of Western form of liberal democracy – particularly that of United Kingdom – adopted the ideal of liberal democratic state. At present, she is regarded as the largest representative democracy of the world where on regular basis as per the Constitution of the independent country government is elected by the people/citizens of the country through simple voting. Although education – particularly primary education was not rendered the status of Fundamental Right by the makers of Indian Constitution, it was mentioned in the Directive Principles of the State, which makes it as a duty of the Indian state to provide basic and primary education to all in the country. In fact, Indian state too adopted some welfare-centric policy stances within the feasibility of its limited resources. Social Justice was made one of the four major objectives of India's Five-Year Planning which started in April 1951. Indian case is to some extent comparable with that of China which also after its Socialist Revolution in 1949 adhered to the path of economic planning for overall socio-economic development in tune with the demand for

modernisation and also, for a industrial society. China too laid great emphasis on universalisation of basic and primary education, and took major and concerted efforts to raise the literacy rate of common Chinese.

India is a vast country with over 1.2 billion people. Close to 200 million children study in primary and secondary schools. The majority of these children are in rural areas, spread over 600,000 villages. Today China is one among the top countries of the world which can take pride in their high literacy rates (above 90%). However, India still after the six decades of planning has failed to reach that level. Literacy rate in India (as per the latest Census of India 2011) is nowhere near the 90% mark, and further there is great inter-state divergence between the states and also, between the districts within a state in India in this regard. The overall literacy rate of India as per Census 2011 is 74.04% compared to 65% in 2001. Kerala has the highest literacy rate of 93.91% among the Indian states whereas Bihar has the lowest, which is 63.82%. Serchhip in Mizoram is the district in India with highest literacy rate (almost cent percent literate – 98.76%) while Alirajpur in Madhya Pradesh is at the bottom in this regard among the districts in India with hardly 37.22% of population (excluding 0-6 years age group) being literate. Hence, the inter-state as well as inter-districts differences at the all-India level are huge and alarming even after six decades of Independence. This is more so alarming because since the very beginning the Government of India and the State Governments have been allocating financial resources to expand and improve the basic education and have taken special literacy drives from time to time including focusing on Adult Education to raise the literacy level of the common place. However, as the Census 2011 indicates (which is the seventh one after India gained Independence) not much success is visible in the literacy front as yet. And the outcome of Public Spending on Basic Education and literacy drives has yet to yield any sustainable impact and have always lagged behind the targets.

The plight of West Bengal is no exception although the state lies above the all-India rate as far as literacy rate is concerned. As per Census 2011, the literacy rate of West Bengal is 77.08% which has increased from the Census 2001 figure of 68.64%. However, within West Bengal once again great inter-district variations in literacy rate is discernible. For example, Purba Medinipur tops the list with 87.66% of its population excluding 0-6 age group being literate and Uttar Dinajpur lies at the bottom with only 60.13% literacy rate.

Literacy has traditionally been described as the ability to read and write. It is a concept claimed and defined by a range of different theoretical fields. The UNESCO (United Nations' Educational, Scientific and Cultural Organization) defines literacy as the "ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society." (UNESCO Literacy Portal as available online) India at present is the home of largest number of illiterate people in the world.

Significance of Primary Education

Primary education signifies the foremost and most basic education which lays the foundations for the subsequent level of education, and at the same time which at least makes a person literate and endowed with some basic knowledge of the world considered essential for his/her decent living. Development of a country is related to primary education. Education is the qualitative indicator of development. There are some objectives of primary education:

- Foundation of economic and social development of a country as well as human resource development also and growth of the country.
- Eradication of poverty and inequality in income distribution.
- Improve child's personality by providing for his/her physical, intellectual, social, emotional, moral and spiritual needs.

Both Gandhi and Tagore laid great emphasis on basic and primary education. While Gandhi talked about *buniyadi siksha* (foundational education) to generate capability, and to inculcate ethical moral values, Tagore took to the tradition of *ashrama vidyalaya* following the ancient Indian tradition to create human beings. In both cases basic and fundamental knowledge for making a complete man was stressed. Neither Gandhi's vision and ideal nor Tagore's wisdom and principles were followed by the policy planners in Independent India from the very beginning. The model of primary education with state playing the most important and large role (particularly in the rural India) was the idea based upon school-based education borrowed from the Western World. Some indicators were chosen for evaluating the progress in the primary education front like literacy rate, female literacy rate, student enrolment ratio, drop-out ratio, and teacher-student ratio etc. No doubt they are no less important in judging the expansion of primary education among the masses. But they surely cannot tell us the quality and/or level thereupon of basic and fundamental knowledge of an average Indian necessary for his/her survival through generations meaningfully as human beings or as effective human resources.

Primary education is a socio economic need of a country. Primary education is the pillar of a country by which one country can develop human resource base and man power in a modern society. Primary education is also known as elementary education. We would interchangeably use these two terms. Both the words primary and elementary mean something without which proper beginning cannot be made.

One of the important qualitative components of development of a country is education. One may expect a positive relationship between education and the development of a country. As the level of education improves the country will develop and vice-versa. So, improvement in human development, economic and social development depends upon the level of primary education (Kaushik, 2010, pp. 253-261). Primary education act as a vital factor of human resource development and for the sustained growth of the nation. Education in India, therefore, is the foundation on which the development of every citizen and the nation as a whole hinges. Education

process provides technological discoveries or more effective uses of available technologies by affecting human capital. In other words it can be concluded that education provides a contribution to qualified labour force which is the basic source of element providing continuity of economic development and economic growth.

Universal basic education will facilitate economic development by creating an efficient work force and enabling many people to exploit economic opportunities (Sharma, 1998, p. 1640). Education is the principal instrument of developing human capabilities that provides the instruments for liberation from ignorance and oppression and an investment in human capital. Education is now widely valued not only for its intrinsic value but also for its functional value in the development of the human capital (Bhalotra and Zamora, 2006). It is argued that removal of the poverty trap necessitates education. Economies with low or high levels of education can escape the poverty trap, and inequality plays a key role in determining whether this occurs through a change in institution or an expansion of education (Steeten, 1984, pp. 973-978). Education is one of the most important social indicators, i.e., directly linked with economic development. Level of literacy or education is directly associated with gross domestic product, indirectly with poverty, population growth, health and crime rate. Despite its importance, education continues to be a neglected area at the policy level (Reddy, Rao, 2003, p.1242). Education is also needed to decrease the fertility rate which help to reduce the growing population of a country. The strong effect of overall primary levels of education, fertility declines and subsequent changes in age structure on improvements in the democracy indicator.

Education is a process by which human beings and societies reach their fullest potential. Education is critical for promoting sustainable development issues. It is also critical for achieving environmental or ethical awareness, values and skills consistent with sustainable development and effective public participation in decision making. Education has also been considered as the key component of human development and greatest liberating force. Hence traditionally education has always held the most venerable position in our society. It is considered as fundamental to all round development of the individual both at material and spiritual levels. Education is intrinsically intertwined with the development process and constitutes the instrumentality of modernisation of tradition (Raza, 1990).

The role of education in economic development has been noted by the researchers (Sodhi, 1985 and Singh, 1974). At the micro level the direct and indirect role of education through value orientation in economic development has already been established (Bhagat, 1989). Education is also vital to sustain competitive markets and viable democracy. Even at the macro level, social benefits of elementary education are immense. Educated parents send their children to school; elementary education leads to perpetuation of benefits from one generation to another (Sinha, 2004, p. 628).

Primary education is the foundation on which the development of every citizen and the nation as a whole built on. In recent past, India has made a huge progress in terms of increasing primary education enrolment, retention, regular attendance rate

and expanding literacy to approximately two thirds of the population. India's improved education system is often cited as one of the main contributors to the economic development of India. At the same time, the quality of elementary education in India has also been a major concern.

Literacy is not the simple reading of words or a set of associated symbols and sounds, but an act of critical understanding of the situation in the world. Literacy is not an end in itself but a means of extending individual efforts towards education, involving over all inter disciplinary responses to his problems. Literacy leads to education and results in empowerment with the acquisition of the essential knowledge and skills, which enable one to engage in activities, require for effective functioning of the individual in his group and community and use these skills towards his own and his communities development.

Education is crucial to every aspect of social and economic development. One also notices that education is also important for influencing social behaviour. Education widens people's choices. It expands the perceptions and capabilities for leading a better quality of life. Adequate and good quality food (nutrition), access to safe drinking water, better health care services, relevant and quality education for children and youth constitute the core element of one's life.

Children are the future of a nation. For an emerging and developing country like India, development of underprivileged children holds the key progress of the nation itself. Education for underprivileged children is the key whether we are addressing healthcare, poverty, population control, unemployment or human rights issues.

Primary Education and Development

Development means much more than just an improvement in the economic well-being or condition of community members. Developments include the fulfilment of each person's material, spiritual and societal needs. Development is a purposeful change in a society that contributes to social and economic well-being and advancement of its people without creating any disharmony.

The development is a dynamic process. Development empowers people and promotes important changes in their lives. However development cannot take place by itself. It requires an educated, skilled and competent people. Education becomes the most important factor for development as well as for empowering people. Education provides people with knowledge and information which in turn bring about desirable changes in the way people think, feel and act. Education also builds in people a strong sense of self-esteem, self-confidence. It contributes very effectively to the realization peoples' potential. Therefore education is considered as a social instrument for developing human resources and for human capital formation. The principle institutional mechanism for developing human skills and knowledge is the formal education system. Most developing nations have been led to believe or have wanted to believe that it is the rapid quantitative expansion of educational opportunities which holds the basic key to national development. The more education, the more rapid is the anticipated development.

Education is one of the most important services provided by Govts. in almost every country. The Indian constitution enshrines in the directive principle of state policy compulsory primary education to all citizens. However, inadequate attention is paid to the delivery mechanism of the primary education. Thus remains a basic Achilles' heel in the development process in India. In fact the inadequacy had added to injustice and inequality while stunting the prospect of development (Sengupta and Pal, 2010).

Mere assurance of physical access to education cannot guarantee quality education (Ramachandran, 2004; Sengupta, Sengupta and ghosh, 2004). Although several attempts have been made in the past to assess the accessibility, enrolment and learners' achievement, little information is available on the internal efficiency of primary schools in the country.

However, the relationship between and development is not as it appears to be. In fact, the impact of education on development depends basically on what we teach and how much the learners learn. In simple words, it is the education contents and the teaching methods that make the difference. Equally important is the interaction of education with other social and economic factors. Education can only be useful and meaningful when it brings about positive changes in one's life and empowers a person face to face day-to-day challenges. On the same ground, you may assert that education becomes meaningful when it provides knowledge and skills of reading, writing, simple arithmetic and problem solving and for improving the quality of life. Education organised and oriented on these lines is certainly going to have a lasting impact on income, agricultural productivity, fertility rate, birth spacing and pre and post natal health, nutrition, knowledge, attitudes and values.

Social change can be possible through education. Education can help a society to expand faster and faster. It helps to improve the thinking power of the people which needs for a society for development. People can think logically and can remove all sorts of superstitions with the help of education. The role of education as an agent of social change and social development is widely recognised today when the existing social system fails to meet the existing human needs and when new materials suggest better ways of meeting human needs, social change takes place. Social change does not take place on its own. Social change takes place as a response to many types of changes that take place on the social and non-social environment. Education can initiate social change by bring about a change in the outlook and attitude of people. It can bring about a change in the pattern of social relationships and thereby it may cause social changes. It is also expected that education ensures improvements in socio-cultural and organizational structures, besides its contribution to economic development and economic growth. Particularly education has a substantial place in eliminating traditional structures hindering economic development (Demir, Ince, Mehrnaz and Amin, 2006).

The new theory of the economic growth underlines the fact that the education has a strong impact on the economic development from two points of view. First of all, the human capital is an input in the production function, thus explaining the options for the investment in education and society, the factors that involve the endogenous-growth

especially the technological progress are correlated to the human capital stock because either it is supposed that it directly determines new technologies or new knowledge or it is an essential aspect for the research field that generates technology and knowledge. In the same direction more educated countries are developing faster due to the fact that the school enables the labour force to innovate new technologies to adapt the existing ones to the local production. (Harmon, Oosterbeek, and walker, 2000).

There was a time when educational institutions and teachers were engaged in transmitting a way of life to the student. During those days, education was more a means of social control. But now the time has been changed. Education plays an important role for social change. If we want to bring about change in the society, we need to work from the grass root level. That is primary education (Modi, 2012, pp. 2277-2456).

In the Third Five Year Plan (1961-1962) the Indian Planning commission described education as the most important single factor in achieving rapid economic development and technical progress and in creating a social order founded on the values of freedom, social justice and equal opportunity. The report of the Education Commission (1964-1966), bearing the eloquent title of education and national Development; makes an even stronger assertion that for achieving change on a grade scale there is one instrument only, that can be used: Education. The commission also believed that in fact, what is needed is a revolution in education which in turn will set in motion the much desired social, economic and Cultural Revolution. The sequence is therefore, very clearly indicated between education and social change (Kamat, 1966, pp. 7-9).

Education is also required for sustainable development. Sustainable development means a mode of human development in which resource use aims to meet human needs while ensuring the sustainability of natural systems and the environment, so that these needs can be met not only in the present but also for generations to come. In 1987, the United Nations released the Brundtland Report which included what is now one of the most widely recognised definitions that sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987). Education is essential to sustainable development. Citizens of the world need to learn their way to sustainability. Our current knowledge base does not contain the solutions to contemporary global environmental, societal and economic problems. Today's education is crucial to the ability of present and future leader and citizens to create solutions and find new paths to a better future.

Literacy Rate in India

India defines literacy as the ability to read and write for a person aged 7 or above, which is roughly equivalent to UNICEF's definition. Census figures from 2001 put India's literacy rate at 65.4% leaving over 250 million (counting only people above the age of 7) people who can't read and write. The female literacy levels are worse. In 1991, less than 40 percent of the 330 million women aged 7 and over were literate,

which means [then] there are over 200 million illiterate women in India. The situation has improved marginally in 2011 with still around 35% of women in India above 7 years age group can read and write. A country hailed internationally for its engineers and doctors is also home to about a third of world's illiterates (UNESCO, 2000).

However, literacy is not the only criterion to judge the level of basic education of a country. In India literacy simply means ability to read and write. A nation's literacy rate is determined, to a great degree, by the definition of literacy and the method used to measure it. Countries struggling to achieve higher rates often tend to lower definitional bars, which then makes progress that much easier. India is no exception, and this raises simple but unanswered questions. How many of India's a literate person — literate according to the Census—can read the headlines of a newspaper? Somehow the majority of the literates in India can sign their name. That is all.

Level of primary education can be judged in terms of extent of literacy rates in a country. As already mentioned above, even after six decades of Independence, there are wide and wild variations in literacy rates among the states of India. Kerala, Maharashtra and Himachal Pradesh show high literacy rates whereas Uttar Pradesh, Rajasthan, and Bihar show low literacy rates. Still at the all-India level the country is yet to achieve the full literacy. This puts a question mark on our much avowed planned development and also on, liberalization and globalization-led and market-driven high growth process!

In India, shortfall in pupil enrolment and retention, especially in rural areas, in urban slums and among girls and members of scheduled castes and tribes remains a severe challenge for a long time. Our feeling is that not only the quantity but also the quality of primary education need to be emphasised if the goal to create meaningful and capable human resources in this age of neo-liberal globalisation. With improved quality, one may expect better results in terms high literacy rates, high student enrolment and retention ratio at least, and also, a much better human resource well-endowed with skill and knowledge. Otherwise, social justice as an avowed objective of Indian Plans would remain s hollow cry. India would grow but with it would also grow the number of illiterates, ignorant and destitute masses with "inclusive growth" making only illusory dents.

Despite emphasis being put on primary education in India during the Planning Period, the extent of primary education (both quantitatively as well as qualitatively) is quite low in India. Of late, Government of India has enacted Right to Education Act. There are so many loopholes regarding primary education in India despite some achievements being made in the post-Independent period. The critical aspect of the Indian public education system is its low quality. Studies focusing on quality of primary education in India are rare as most of the studies have tried to assess the extent of primary education in terms of Government fund allocations and realisations along with some broad quantitative indicators which hardly reflect the quality that must be ensured while imparting primary education.

Even in most of the Third World republics which became liberated from the colonial rules, and adhered to democracy and welfare-state stance stressed upon universalisation of primary education as one of the basic responsibilities. India was no exception. Although primary education was not recognized as one of the Fundamental Rights in the constitution of India which was adopted in 1949, it found its place in the Directive Principles of the state policies signifying it as one of the major duties of the Indian state (as supplier of primary education) — though not obligatory as none of the Directive Principles bears any element of compulsion for the state as they were framed by the founding fathers of the Indian republic in the Constituent Assembly. Sixty-two years after India's independence, many of children's are still not getting schooling. Although a constitutional directive urges all states to provide free and compulsory education for all children up to the age of 14, India is still far from achieving it. (as cited in www.dw_world. de).

The extent of primary education is quite low on India. The present scenario of primary education in India is quite unsatisfactory. Only 66% of the Indian people are literate (76% of men and 54% of women). It is very painful that many villages in India have no primary school. The poor performance of the basic schooling is that most of the primary schools are unattractive – physically and pedagogically. The official policy is that a primary school must have at the minimum two rooms, two teachers and a pupil teacher ratio of 40: 1. It must be located within a kilometres walking distance for a child (Ramachandran, Mehrotra, Jandhalaya, 2007).

Indicators of Primary Education

To illustrate the problem of primary education some quantitative and some qualitative indicators are required. There are some quantitative and some qualitative indicators by which the quality of the primary education can be judged. Some of the indicators may be the cause or effect of the problem of primary education. Following the existing literature for our purpose, we distinguish the indicators as cause and effect indicators. Cause indicators reflect the factors which may be held responsible for level and status of education while effect indicators signify the achievement so far in terms of imparting education. The relationship between these two types of indicators can best be described as the relationship between heat and temperature while heat is the reason temperature is the outcome of heat. Below we have attempted to identify some of the cause indicators:

Table 1: Cause Indicators

Quantitative Indicators	Qualitative Indicators
Physical Infrastructure	Parental attitude/orientation
Teacher-student Ratio	Teacher student relationship
Financial Resources	Socioeconomic background of teachers and students
Government Programmes for education	Gender-based orientation

Among the effect indicators we can mention the following few:

- Drop-out ratio
- Enrolment ratio
- Literacy rate
- Ability to read and write properly

Broadly we distinguish the indicators as quantitative and qualitative ones. While quantitative indicators like number of class rooms in a school is easy to compute or quantify, qualitative indicators like parental attitude is not easy to quantify. However, following the tradition of statistical analysis pertaining to attributes which are qualitative in nature we will assign numbers or weights to different grades of a particular indicator like parental attitude and try to quantify them also.

Problems of Primary Education in India

One of the major problems of primary education is related to physical infrastructure. Most of the primary schools are suffering from this problem. The space of the classrooms, teacher's room, and office room is very scanty and of low quality type. Due to inadequate space for classroom students are not properly accommodated. On the other hand in most of the schools in India (especially which are located in rural areas) the toilet facility is very poor. The drinking water facilities as wells as electricity facilities are not up to the mark. Half of India's have a leaking roof or no water supply. 35% of the schools have no black board or furniture, and close to 90% have functioning toilets (Ramachandran, Mehrotra, Jandhyalay, 2007). There is hardly any playground for the student.

There is insufficient and low quality reading materials for students. As a result, the quality of education remains very low. Most of the students have no proper school uniform. Another problem is the lack of adequate meal before attending school what has usually been referred to as short-term hunger, which has an adverse impact on the child's performance in school, his/her ability to concentrate as well as learn new concepts. (Ramachandran, Jandhalay, Saihjee, 2003).

Another problem of primary education is teacher absenteeism, low quality teacher, inadequate number of teacher, and poor availability of teacher. Supply of education refers to both availability and the quality of school facilities materials and teachers. The lack of qualified special education teachers threatens the quality of education that students with disabilities receive. (Bonnie S. Billingsley, 2004, pp. 2-4). Due to the shortage of skilled teacher the quality of primary education does not improve. There are four major things related to supply factors. These are teacher's characteristics and personal factors, teacher's qualifications, work environment, and teacher's effective reactions to work. The attitudes of teachers in urban areas remain a big issue. The social distance between teachers (who are middle class) and vast majority of children (who come from extremely poor families) reveals vast and abusive behaviour, derogatory language and punishment which in turn affect the self-esteem and confidence of children. (Ramachandran, 2006,

p.383). The teachers are not made accountable for learning outcomes of children, especially in the primary and middle schools where there is no board examination. (PROBE 1999, Vimala Ramachandran 2002, Pratichi Education Report 2002, Jha and Jhingan 2002).

In primary schools of India the teacher student ratio is very low. The Student teacher Ratio is defined by the ratio between student and teacher, i.e. the number of teachers in a school with respect to the number of students who attend the class. The student teacher ratio is 42:1 at the primary level, i.e. there is one teacher at every 42 students. Rise in this ratio implies the number of students increase rather than increase in school teachers and vice- versa which is not desirable. So, to improve the quality of primary education the ratio should be reduced. There should be a proper balancing of student-teacher ratio (Pratichi Education Report 2002).

Gender disparity is measured by the ratio between female participation in education to male participation in education. The gap between female participation in education and male participation in education is called gender disparity. High gender disparity implies the female participation in education is very low. Census figures projected during 1991–2001 (Selected Educational Statistics Primary Education 1999–2001 MHRD, Government of India) show male literacy to be 63.86% and 75.85% against female literacy of 39.42% and 54.16%. Out of 13,459,734 dropouts from Secondary schooling, 6.08% are males and 7.98% are females. There is a wide gender disparity in the literacy rate in India. Effective literacy rate in 2011 were 82.14% for men and 65.46% for women. The low female literacy rate has had a dramatically negative impact on family planning and population stabilization effort in India (en. wikipedia.org/ wiki/ literacy –in-India).

Demand for education is created by the decisions that parents make largely on the opportunity cost schooling but also on the influence of cultural and religious factors. Children from poor households are not very regular. They tend to absent themselves for a range of reasons. Some parents said that they need their children at home for small chores especially during the heavy agricultural seasons, when a child is sick or when they have to migrate for work. (Ramachandran, Jhandhyala, Saihjee, 2003 p. 4994).

The teacher student relationship is the most important factor to judge the quality of primary education. It depends on the quality of teachers and his/her level of commitment towards the students. (Ramachandran, Jhandhyala, Saihjee, 2003)

Primary education in India is characterised by high dropout ratio. Recent research indicates that an important factor explaining both the high dropout ratio and also the persistence of out of school children in the stark fact that many of our schools are unattractive, physically and pedagogically. (Ramachandram, Mehrotra, Jandhyalay, 2007). 40% children in the age group of 6 to 14 years remained out of school's on March 2005, four years after the launch of the Sarva Shiksa Aviyan. Drop out ratio in 2002-2003 34.9% at the primary level.

Total enrolment at an educational level irrespective of age is a percentage to the corresponding school age population. In India the enrolment ratio in education is very low. Many children are excluded from an education because of poverty, conflict, their special needs, their gender etc. Costs associated with education, e.g. school fees and school uniforms, personal text books, costs for teaching materials etc. Inadequate water and sanitation supply at the school need to work or help out at home, e.g. looking after ill family members help to reduce the enrolment ratio in education (Robert, 2011).

For a long time, poor performance on the basic schooling front was attributed to a lack of schools and teachers on the supply side and poverty, parental attitudes, social barriers and prevalent social custom on the demand side. Significant progress has been on both fronts. The official policy is that a primary school must have at the minimum two rooms, two teachers and a pupil teacher ratio of 40:1. It must be located within a kilometres walking distance for a child.

Elementary education in India means eight years of schooling from the age of six. The 86th Amendment to the Constitution of India constitution made free and compulsory education a fundamental right for all children in the 6-14 Age Group. The Government has made elementary education compulsory and free. But the goal of universal elementary education in Indian has been very difficult to achieve till now (Chandrashekhar, Mukhopadhyay, 2006). The Union Government is preparing a free and compulsory Education Bill in order to make the 86th amendment to the constitution that has made elementary education a fundamental right, statutorily enforceable. State governments may follow enacting their own legislations (Jhandhyala, Tilak, 2004, p. 618). Until now elementary education in India is neither free nor compulsory. Free education is defined to refer to only tuition fee free education. The proposed bill goes a little bit forward, and state that free education should mean that no fees or charges of any kind are levied on students.

Most states with the poorest educational indicators have serious problems with the structure and sustainability of their pattern of public spending. The high achieving states have a relatively higher per capita expenditure on elementary education than the rest. The low per capita expenditure in the educationally backward states is the result of three factors: their low resources in general, relatively low fiscal priority attached to education by state govt. (Mehrotra, 2004, p. 987)

In a recent qualitative research study funded by World Bank Educational Resource unit, explored factors that contribute towards or impede successful primary school completion among children living in diverse poverty conditions. The issue was approached from select vantage points across five social domains—the child, family, community, institutions, (pre-school and primary school), and other services health care, sanitation, water, transport, etc.). This domain approach helped understand the causality as well as social processes, implicated wholly or partially, in children's full participation in schooling (e.g., poverty, class, gender, birth order, ethnicity, lack of schools or transportation, poor health, etc.).

Expenditure on Primary Education

Education in India is mainly provided by the public sector, with control and funding coming from three levels federal, state, and local. As a part of the five year plan (2002 to 2007), the central govt. of India outlined an expenditure of 65.6%of its educational budget of ₹ 432.25 billion i.e. on elementary education 9.9%, i.e. 43.25 billion. While India's central govt. has been increasing expenditure on elementary education, the overall fiscal problem of state govt. remain severe especially in the which account for two thirds of the country's children out of school. (Mehrotra, 2004 p. 987).

Public expenditure on education in India has been rising over time. The allocation to education can be increased by reallocating resources from other sectors or by raising more resources for the common pool of govt. funds or by both. However, a generous approach needs to be adopted in allocation to and reallocation of resources in favour of education. (Jandhyala, Tilak, 2006 p. 613).

While the amount of expenditure on elementary education matters, the efficiency and equity of the spending also, equally important. A main determinant of the efficiency of education spending is the distribution between various heads of recurrent spending, since it accounts for, on average 85%–90% of educational spending at the elementary level in developing countries. A major determinant of the efficiency of recurrent spending is the allocation towards teacher salaries compared with non-teaching inputs since the balance between the two ensures that there is neither a shortage of teachers, nor a shortage of teaching learning materials. The main determinant of equity in education spending is its distribution by levels of education, namely, elementary, secondary and higher.

Programmes for Primary Education

So far the Government of India from time to time has implemented several programmes to raise the literacy rate and also to spread education all over the country. They include (i) the District Primary Education Programme (DPEP), which was launched in 1994 with an aim to universalize primary education; (ii) DREP which had opened 160000 new schools including 84000 alternative education schools; (iii) Sarva Shikhsa Abhiyan (SSA) which aims at universalisation of education for all and which is the largest education initiative in the world; (iv) Mid-day Meal Scheme which was launched in mid-1995 as a national programme for nutritional support to the primary level students; and, (v) Integrated Child Development Scheme (ICDS) launched in 1975 with a view to provide both health and nutritional support to a child at the pre-primary age.

In spite of the several attempts of the Government of India to achieve universal education for all through programme like SSA and the attempts to attract girls' students in large numbers these goals are still to be achieved. (Khasnabis, Chatterjee, 2007 pp. 2091 to 2098).

The govt's. flagship programme *Sarva Shiksha Abhiyan* (SSA) has done this miracle. In 10 years, SSA has achieved following: (Kulkarni, 2013)

1. Out of school children number has been brought down significantly (8 million in 2009, 3 million in 2012).
2. Big boost to additional school-195,000 primary and more than 100,000 upper primary schools sanctioned.
3. 2 million additional teacher posts.
4. 1.8 million additional classrooms approved 230,000 drinking water projects approved.
5. Girls' admission improved dramatically. Gender parity is achieved.
6. The scheme supports 200 million children in 1.4 million schools on the country.

Under the Mid-day Meal Scheme programme, cooked mid-day meals are served in all government and government- aided primary schools within two years of the launching of the programme. In the intervening period, state governments were to allow distributing monthly grain ration (known as 'dry rations') to school children, instead of cooked meals. Six years later, however, most state governments were yet to make to the transition from dry rations to cooked meals. Mid-day meal can be seen as a form of economic support to the poorer sections of society. More importantly perhaps mid-day meals facilitate school participation among underprivileged children. This is likely to reduce future class-caste-religious disparities/inequalities. The case for mid-day meals can be made from at least three crucial perspectives: educational advancement, child nutrition, and social equity (Dreze, Goyal, 2003, p. 4673). One basic contribution of mid-day meals to educational advancement is to boost school enrolment. Going beyond that, mid-day meals may be expected to enhance pupil attendance on a daily basis. A survey of primary education in selected areas of Dumka district in Jharkhand indicates that while incentives such as mid-day meal schemes are useful, the most effective input is community participation in the governance of the schooling system (Rana, Das, 2004, p.1171). Earlier research on primary education in rural India suggests that mid-day meals enhance school participation, especially among girls. One recent study estimates that the provision of amid-day meal in the local school is associated with a 50% reduction in the proportion of girls who are out of school (Dreze, Kigdon, 2001).

Another program related to primary education is the Integrated Child Development Scheme which is known as the ICDS program. A major finding relates to the ineffectiveness of the pre-school education component of the ICDS programme in all (except one) centres observed in recent studies [NCAER, ICDS, Field study 1999].

Barriers to universal primary education in India

1. India is a developing country with a population of over one billion. A significant portion of that population lives in poverty: 26% lives on less than US $ 1 a day and 35% are considered illiterate.

2. In a large country physical distance can be issue. In rural areas, some communities do not have a school nearby. In urban settings, unsafe travel conditions, such as travelling alone or crossing busy roads and train lines, may prevent parents from sending their children to school.
3. Social distance can be even greater hurdle, some communities do not see the value of school education, and they feel the things learned at school are not relevant to their lives. In some cases, the school may be in another community of a different socio economic class, caste or religion, making it difficult for the child to cross that invisible but effective barrier. While discrimination on the basis of caste is now illegal, attitudes of thousands of years are difficult to change quickly.
4. Gender gaps exist. Literacy rates are 21% lower for the females than for male. Among those children aged 6-14 are not enrolled in school, more than 60% are girls. Some communities do not see the need to educate daughters because they will be married off at an early age and live and work with their in –laws, mostly doing house work and raising children.
5. Child labour is prevalent. Many children need to work and earn in order to supplement a meagre family income and therefore do not attend school.
6. School often lack facilities and teaching aids including classrooms space, toilets, drinking water, blackboards and chalk.
7. Teachers lack training and motivation.

Universalization of Primary Education

The Universalisation of elementary education has been the main goal of all educational policy and planning. The present school education structure, evolved over the ages, comprises 5 years of primary education (class I – V), 3 years of upper primary (class VI – VIII), 2 years of secondary education (class IX – X) and 2 years of senior-secondary education (class XI-XII); primary and upper primary taken together comprise elementary education. Various attempts have been made during the post-independence period. Yet in spite of our assets and efforts our national educational scenario appears to be grim, particularly school education; about 12.5 crore children (including drop-out) of age 6-14 are out of schools. This calls for a detailed investigation on this issue.

The contribution of primary schooling to economic development is greater than has conventionally been perceived. The recent research shows that primary schooling increases labour productivity in both urban and rural sectors, and the economic returns to such investment are typically high. In addition, it reduces fertility, improves health and nutrition and promotes other behavioural and attitudinal changes which are helpful to economic development. Investment strategies which give primary schooling an important place would be more conducive of growth-with-equity than many alternatives (World Development, 1982).

Universal primary education is a goal stated in many national development plans and pursued with vigour by govts of most developing countries. Primary education is seen as the first step in laying the foundation for future educational opportunities and lifelong skills. Through the skills and knowledge imbued, primary education enables people to participate in the social, economic and political activities of their communities to their fullest potential. It is also seen as a basic human right that frees human beings from a state of ignorance and helps to reduce the negative effects of poverty, relating in particular to health and nutrition. In an increasingly competitive global economy of free markets, a well-educated high quality work force is seen as vital to a country's economy in order to attract foreign investments generate jobs and create wealth. Hence good quality primary education is increasingly recognised as an important foundation for economic growth and seen as instrumental in the attainment of other development objectives (Webster, 2000).

Whether economic growth, poverty reduction or human development and well-being come to represent the super goal of development, education and learning underpin all three. Education can help to increase economic growth reduce poverty and increase well being. Education and learning have direct effects on economic growth, poverty reduction and human development. Education and learning have indirect effects through their direct effects on health, nutrition, fertility, maternal and child mortality and care for the environment and the direct effects of these on economic growth, poverty reduction and human development. Education and learning enjoy reciprocal effects with the economic growth, poverty reduction and human development and with health and nutrition, water and sanitation. Poverty restricts investment in and the demand for education by households. Poverty is associated with low education of parents, malnutrition and poor health of household members. All three are linked in turn with low enrolment, late enrolment, transition completion and achievement of their children in school. Absence of sanitation and access to safe drinking water at both home and in schools is associated with health problem which reinforce the effects of poor health on educational access and attainment. Low education outcomes of children increase their chances of remaining in poverty. Moreover when actions are taken across each of these areas simultaneously synergies and virtual spirals arise which add value to the separate effects of one on the other. Education and learning have direct, indirect, reciprocal and synergies effects on development. (Little, 2013)

The effect of education on poverty could be indirect through its fulfilment of basic needs like better utilization of health facilities, shelter, water and sanitation and its effect on behaviour of women on decisions relating to fertility, family welfare and health etc which in turn enhance the productivity of the people and yield higher wages, taking them above the poverty line. Poverty declines consistently by increasing levels of education in developing countries.

Education as a Fundamental Human Right

The right to education is a fundamental human right. Every individual irrespective of race, gender, nationality, ethnic or social origin, religion or political preference, age

or disability, is entitled to free elementary education. This right is explicitly stated in the United Declaration of Human Rights (UDHR), adopted in 1948. Ensuring access to education is a precondition for full realization of the right to education, without access, it is not possible to guarantee the right to education.

Quality of education is the other side of the coin. Providing access to schools secures only one part of the right to education.

The right to education does not limit education to the primary or the first stage of basic education or among children of a particular age range. The right to education is also not an end to itself, but an important tool in improving the quality of life. Education is key to economic development and the enjoyment of many other human rights. Education provides a means through which all people can becomes aware of their rights to responsibilities, which is an essential tool for achieving the goals of equality and peace.

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8

Rural Development Schemes in India: Need for a Unified Programme

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Abstract

In recent years a number of projects have been undertaken by the central and state Governments in India to allocate resources for rural development purposes at various levels. The objectives of these schemes are directed towards achieving an all-round development of rural sphere through provisioning of resources towards segmented but related developmental orientations. Quite often it is found that the sheer multiplicity of programmes meant for similar purposes has an overlap of focuses and sometimes there is delay in the utilization of funds in the absence of proper identification of beneficiaries and lack of timeliness in the sanctioned allocations. At this point it is hypothesized that unification of these schemes under one single programme may serve the developmental purpose in a far more efficient and easily manageable way than what is at present.

Keywords: *NREGA, fund, integration, programmes*

Introduction

In recent years quite a number of projects have been undertaken by the central and the state Governments to allocate resources for rural development purposes at various levels. The objectives of these schemes are directed towards achieving an all-round development of rural sphere through provisioning of resources towards segmented but related developmental orientations. The crisis areas of development can be broadly identified as health issues, educational perspectives, infrastructure development encompassing roads and communication, housing, water shed development as well as sanitation facilities, coverage under social welfare/insurance and employment guarantees. For each niche arena of projected development there are afloat a number

of schemes with quite a lot of funding allocated for the specific purpose. For instance, the diverse rural development schemes oriented towards infrastructure development can be identified as BRGF, DPAP, MPLAD, BEUP, PUP, PMGSY, IAY, ASHRAY, SAHAY, IWDP, Sajaldhara, Horticulture project, TSC, FC fund etc; programmes related to health combine CHCMI, ICDS etc; backward region and social welfare development is focused by schemes like PROFLAL, AABY, IGNOAPS, NFBS, BCW FUNDS, BRGF etc while employment oriented schemes are SGSY, NREGA etc. In fact, in rural areas, for the implementation of various socio-economic programmes, there are about 35 departments handling about 150 schemes under 29 subjects as identified in the llth Schedule of 73rd Constitutional Amendment. For the sake of simplicity of analysis all these various kind of programmes may be divided under four heads viz. economic, infrastructure development, service and social sector. Under each category there are multiple schemes that are recommended for implementation. Amongst these, the rural infrastructure sector combines a wide diversity in focus areas like rural housing, roads and communication, water-resources, irrigation facility, sanitation, school buildings, healthcare infrastructure etc. Quite often it is found that the sheer multiplicity of programmes meant for similar purposes in the infrastructural sector has an overlap of focuses and sometimes there may be delay in the utilization of such funds in the absence of proper identification of beneficiaries and lack of timeliness in the sanctioned allocations.

Sometimes even social sector schemes may have some infrastructural component in them, which further complicate the efficiency in fund management issue. Apart from this, sometimes the objectives of one scheme may come into conflict with the multiplicity of objectives of diverse other schemes. Lack of coordination in the activities of officials in charge of schemes with similar focuses in the infrastructure sector, also poses a great problem. Maximisation of outcome, in the given context, as such, envisages a concerted and coordinated application of efforts and resources by various departments, organisations or agencies, constituting the implementation infrastructure.

Sometimes there is a deliberate tendency to take up schemes involving very small amount, thereby undermining the relevance and potential benefit for the community. Another problem of scheme implementation is the inordinate delay in the spending of money for specific purposes due to lack of timely training imparted to the relevant stakeholder groups who are meant to facilitate the plan implementation process. Often there is tendency on the part of line department officials in utilizing the funds for somehow implementing the schemes than providing a systematic coordinative approach at the decentralized spatial level. There is a great need to chalk out the decision fields and decision levels to avoid ambiguity. The lack of coordination at various layers of execution among these officials due to sheer multiplicity of schemes often renders the system cumbersome. The allocation of funds from the district to different blocks needs careful analysis. Prevalent recommendations suggest that decentralized district plan outlays need to be distributed among the blocks in the district on the basis of population, area and some indices of level of development. But non-availability of relevant data on level of development pose a great constraint towards building some sort of

development indicators. Again it has been observed that like in many other states the line departments often work as watertight compartments with very little or no convergence of resources and services. Moreover, these line departments at the state level control the resources at the district level. The district level line departments are often reluctant to channelize their funds to other departments despite their inability to spend it. Departmentalisation has thus taken deep roots relegating the developmental needs of the rural folk.

Judging on the basis of the aforesaid issues it seems that implementation of a multi-schemed plan is beset with several problems. Comprehensive rural development entails holistic approach involving simultaneous progress in different domains or sectors, viz., economic, infrastructure, social and service. There has been, however, a widespread feeling among observers that development efforts are not sufficiently organised or coordinated to maximise the outcome and impact of various interventions. At this point it may be hypothesized that integration and consolidation of these schemes under one single programme may serve the developmental purpose in a far more efficient and easily manageable way than what is at present (Task Force Report 2008). At the first instance it calls for consolidation of funds of different schemes under a unique programme. However the entire programme may still be viewed as a cluster of different components with earmarked percentages of the total allotment to be spent on each such component. There should however be a provision of exercising flexibility at the fund utilization level through adjusting funds from one relatively less important component to some priority component area. Each component may again be viewed as a conglomeration of several sub-components. Thus the single unique programme may be considered as a conglomeration of several rural development schemes which focus on diverse sectoral components like health issues, education related issues, water related issues, housing and related issues, economic infrastructure issues, specific backward region issues etc.

The New Programme on NREGS Setting

The new programme emerging on consolidation of diverse welfare and development schemes may be modeled to function along the broad guidelines of NREGA scheme, of course with certain modifications. At present it happens to be the single largest scheme with scope for both employment and creation of material intensive infrastructure. Within a few years since its initiation, NREGA has emerged as the pioneer among all the prevailing rural development programmes. Hence somewhat modified guidelines for implementing the new consolidated programme along the NREGA are likely to be easily intelligible and acceptable among all the relevant stakeholders. Even though NREGA visualises important roles for BDOs, SDOs and DMs, the role and responsibility of local self-Governments would continue to be the domineering one and as critical and significant as befits the agent undertaking micro-planning and grass-root level implementation. Further similar to the provision in the NREGA scheme, the single programme should have adequate allowance for employment of additional manpower/

administrative staff in order to enable uninterrupted execution of various component/ programmes.

At present funds under different schemes are disbursed at different times in the year. According to the guidelines set by the Govt. for NREGA, jobs have to be provided based on demand. However in reality due to lack of timely and adequate funding, these lofty guidelines often remain in paper only, as jobs cannot be generated commensurate with demand. Hence if all the funds under diverse schemes are pooled together and are disbursed in two/three installments at specific times within a year, then the Panchayats may get the benefit of (i) a substantial grant at the time of inflow of each installment because of pooled fund (ii) prior information and assured grant at specific time of the year (iii) making an advance plan according to seasonal needs of the locality and (iv) phasing out expenses out of the granted installment and making provision for uninterrupted work opportunities for the job seekers. One feels that after all these schemes are merged together, the pool of financial resources available with the Govt. would be substantial enough to allow for demand driven employment throughout the year. Further if the pooled fund be released from the same source with earmarked percentages for the component programmes, then one need not submit multiple requisitions for fund for different schemes; only one requisition may do the job for asking for fund for different components. The fact that there is no uniformity and time-certainty in release of funds across Gram Panchyats (GPs) even in the same block, is revealed in the following section.

Problem of Fund Grant and Utilization across Diverse Programmes

From survey across GPs it is revealed that excepting NREGA, funds for other programmes are automatically dispatched in the respective accounts of the GPs. But there is no coordination and time-synchronisation across the different granting agencies in the dispatching of funds. Funding authority of different schemes are also different. For instance fund for NREGA is mostly provided by Central Govt[1], BRGF and 2nd SFC by the State Govt, NRHM fund is provided by central, 20% of funds for both of 12th FC and IAY is provided by State Govt. while 80% by Central and in case of PMGSY the central fund is handled by Zilla Parishad.

On an average 40 percent of the total grants is released directly to implementing agencies, usually parastatals of the state governments. As such, the utilisation of the available funds under various grant schemes becomes a function of the institutional setup and efficiency at three levels (Gupta et al, 2011). In case of NREGA, funds are often delayed even after requisition for the same are sent. Current up-to-date financial data vindicate that there is great mismatch in terms of timing and amount of granted fund relative to that of placing the requisition. The requisitions are placed in terms of felt urgency and plan of implementation of some targeted programme together with creating provision of employment for the job seekers. The time gap and fund gap in dispatch of funds in NREGA accounts often upsets the action plan taken at the outset of the year. Sometimes funds are even allocated without any requisition. There is no

formal intimation by the respective higher authority about the timing and amount of granted fund. However despite this shortfall of fund over the year round, a substantial amount is often left unspent. This is perhaps because, all the targeted projects, as visualized at the time of requisitioning for fund, cannot be undertaken because of delay in grant and insufficient fund left for some projects. Sometimes some projects have seasonal character and so if the funds do not match the needed timing of the project, this may have to be left undone or half constructed despite it being an agenda in the action plan. Further often a substantial fund is disbursed towards the end of the year when no time is left for their meaningful utilization. This explains the usual unutilized fund at the end of any year and substantial opening balance for the next year. Mismatch between fund demanded and receipt often hampers timely payment and implementation of NREGA schemes. With a merged fund with related schemes and timely allocation of funds, such problems could be avoided.

Further in terms of action plan, it is often observed that sometimes there is deficient grant for some programmes compared to planned estimates while in some cases this is just the reverse. The table-1 reveals the mismatching between planned estimates and fund grant for some important programmes. For exposition, data were collected from three panchayats in Bolpur block of Birbhum District of West Bengal for the year 2009-10.

Table 1. Annual Estimates, Total Fund and Their Difference across Several Important Schemes

Panchayat	Name of the Programmes	Estimate as per Annual Action Plan (₹)	Initial Balance (₹)	Year wise Grant (₹)	Total Deposited Fund (₹)	Difference Between Annual Estimate and Total Deposited Fund (₹)
Parui	NREGA	29800000	1204	13644303	13645507	16154493
	BRGF	750000	367643	625492	993135	-243135
	2nd SFC	990000	332852	2011	334863	655137
	12th FC	900000	149101	691249	840350	59650
Amarpur	NREGA	16140000	1041603	8883000	9924603	6215397
	BRGF	1900000	13451	524010	537461	1362539
	2nd SFC	850000	194297	215510	409807	440193
	12th FC	850000	198377	1071900	1270277	-420277
Bahiri	NREGA	29677254	302033	19856656	20158689	9518565
	BRGF	720000	576988	692124	1269112	-549112
	2nd SFC	1873707	94306	nil	94306	1779401
	12th FC	1072960	506509	788134	1294643	-221683

Source: Field survey Data.

These panchayats were chosen as they were found to be adept in using GPMS software and were quick in furnishing the required data at the time of survey. In the following table the negative sign before the entries in the last column indicate excess of fund allocations over estimated expenses. In case of Bahiri and Parui there is excess allotment in BRGF, in case of Amarpur excess allotment is found in case of 12th FC. In other cases the total fund allocations have fallen short of estimated expenses. In such programmes sometimes the estimated amount for specific schemes is not matched by commensurate fund allotment and hence such projects have to remain unimplemented thus leaving the corresponding inadequate amount in unspent status. Under a single programme with specific degree of flexibility in fund diversion, the excess fund allocations in one programme could be merged with programmes with deficient fund and so dearth of fund for specific projects would have been to some extent mitigated. Again, although there is the provision of fund convergence for some schemes, neither of the surveyed panchayats was observed to follow it.

This is because as reported by some of them, funds for different schemes are deposited in different times. So programmed action with converged fund in specific schemes is a remote possibility. Further often utilization certificates (UCs) of fund for different schemes are demanded by upper layers of administration at random intervals. This stands in the way converging of fund under similar heads amongst specified schemes. For example, if a scheme be in the process after converging BRGF fund with certain proportion of NREGS and a sudden notification of submission of utilization certificate of BRGF is given to the concerned panchayat, this may place it in a tremendous problem. This problem of submitting multiple UCs can be obviated if there be a single program. Further for instance, the amount of BRGF fund which is often not a substantial amount, may not be sufficient for undertaking more than two/three schemes. But each gram sangsad demands that part of it be utilized for its development needs. Since there emerge multiple demands for the inadequate funds, it becomes extremely difficult to satisfy everybody and decide about the project to be funded by this scheme. The delay caused by the dilemma in decision taking about the beneficiary, often leads to the elapse of the financial year with the fund remaining unutilized. A single programme with converged fund would greatly act as a reliever about this decision dilemma.

Advantages with Respect to Financial Management

Thus, as said above, related and similar type of issues can be clubbed together and still maintaining their individual component identities under various names, but they should all be an inalienable part of a single programme with uniform guidelines related to fund management and account keeping. The immediate advantage that can be visualized out of such a uniformity is the facility in better fund management and efficient account keeping, thereby obviating the need for maintaining multiple ledgers and cash books for multiple schemes. Even if the records or ledgers are maintained aforesaid component wise, there shall be a uniformity with allowed degree of flexibility in adjustment of funding from one component to another. Without the necessity of having multiple bank accounts the accounting procedure would be amply simplified compared

to what is at present. The intricacies involved in maintaining scores of overlapping records and files might also be eliminated in the process.

In this context the GPMS software may have widespread facilities in handling the single unified programme through use of computers. That the manual system has become backward has been recognized by the upper layers of administration and to promote computerized account keeping an order No. 4671/ PN/0/1/4P-2/06 dt 14.9.2006 has also been issued by the Principal Secretary (P&RD). SRD scheme is promoting the introduction of GPMS software in various panchayats across the country. This will be amply helpful in keeping the account up-to-date. In this system daily expenses are to be entered the same day on each respective date. At present the accounting system consists of maintaining a number of subsidiary cash books, cash book, multiple cheque books, multiple cheque registers, multiple ledgers, different pass books in the bank for different schemes etc. The table-2 provides a glimpse about the present state of diversity in the use of subsidiary cash books, cheque books, cheque registers etc together with status of GPMS software across some of the surveyed panchayats. The table-2 suggests that there is no uniformity in the strategic maintenance of bank accounts across the panchayats.

Table 2. Status of Tools of Account Management and GPMS Use across Some Panchayats

Panchayats	No of Subsidiary Cash Books Used	No of Cheque Books	No of Cheque Registers	Use of GPMS Software	Regular Uploading of Data
Bahiri	6	9	1	Y	Y
Parui	4	5	5	Y	Y
Amarpur	9	As per needs of per scheme	1	Y	N (problem of LAN line)

Source: Field survey Data.

Integrating the programmes into a single overarching programme would obviously remove the problems involved in maintaining multiple subsidiary cash books, bank pass books, multiple cheque books, cheque registers etc. The present system involves maintaining individual cheque book for each individual scheme and further maintaining individual cheque register for each respective cheque book. Under a single programme, there would instead be a single account in the bank and a single passbook with all the money under different components pooled together. At present every panchayat has to maintain multiple bank accounts for schemes like NREGA, BRGF, 12th FC, 2nd SFC and others. If it be necessary to know altogether how much money remaining in the bank at the end of the day, then all the individual accounts need to be considered and the remaining balance from each account need to clubbed together-necessitating further

exercise of substantial monitoring labour. A single account amply simplifies this job. However even if there may be single account, single cheque book, single cash book, the necessity of maintaining multiple ledgers for different components and sub-components cannot be set aside. This is because the single account in the bank would not provide the details of break–up of funds coming from different schemes/heads/components. In order to keep such detailed records of scheme/component wise inflow and outflow of funds, different ledgers must be created. Otherwise it would be extremely difficult to know how much has been spent with respect to each individual component/scheme and how much balance left unspent. Without this, account keeping will not be complete and perfect. Even these multiple ledgers can be maintained through the GPMS software. This would enable opening separate ledger pages in the computer for different component parts/schemes and keeping records of day to-day expenses. Like a ledger folio number there would be code number for each individual component scheme. The code no. would enable recognition of the respective component scheme in the computer. When one would open the computer with matching the ledger no and code no, one would get a detailed date-wise break-up of expenses for different purposes under each component programme. The print-out of these different ledger pages from the computer and putting them in a single book form would help generate the general cash book thus obviating the need for maintaining multiple subsidiary cash books.

Further under the present system, the executive assistant has to always remain alert to his usual job of issuing cheques for different type of schemes. There always remains the risk of excess payment/over payment or mixing of payments in one scheme with that of another, in this overloaded nature of financial work. Under a single account system, the financial management on the part of executive assistant would have been substantially simplified, and he could probably be utilized for other jobs as well. Unfortunately the GPMS system has still been left unadopted by a number of panchayats. Possible reasons are lack of adequate training in handling this software or computer skilled staff and sometimes sheer inertia to hold on to the old manual system. Immediate more intensive efforts need be taken to promote the adoption of this system across all the Panchayats to bring uniformity in the accounting system. And further management of a single account with multiple ledgers under an integrated programme of diverse component/schemes would not be possible without such software facility.

Issue of Flexibility in Fund Diversion

Flexibility in fund diversion would be the most cherished outcome of the pooled fund programme. For instance suppose there is immediate requirement of payment to the tune of ₹ 15,00000 for the scale of work undertaken under NREGA scheme. Lack of fund under the scheme does not allow immediate payments while there is sufficient unspent money under BRGF scheme. In a unified fund structure this problem would not arise. Given certain degree of flexibility in fund diversion from one surplus component to some deficit component, surplus of allotments under BRGF could be utilized for NREGA wage payments. However even if their be flexibility in fund use, there should be some limit. For this allotment of a minimum percentage under each component

programme should be binding. Even within each component programme percentage binding need to be fixed for specific sub-components depending on typical need. Otherwise some degree of autocracy may crop in among the programme executives, thus thwarting the development in some focal areas. Thus it might be so that a highly skewed expenditure is incurred for material inputs while setting aside only a paltry amount for wage payments. This would not cater to the subsistence needs of poor rural folk. Under some binding percentage restrictions, caution would have to be exercised at the time of fund diversion while remaining accountable to some higher administrative authority for use of such flexibility. One must have to keep under consideration the case of unskilled/illiterate labourers who cannot do work other than digging earths, plantation of paddy or other saplings or making roads. Hence too much stress on material intensive work would negate the employment potential of this indigent folk. A balance between material and wage ratio must be stricken while allowing for the flexibility in fund diversion.

For material intensive work, pooling the fund of all such programmes with that of NREGA, might result in a substantial fund slotted for material intensive work. Accordingly the material–wage ratio might be raised from the present status of 40: 60 to 50:50. Apart from this, pooling other schemes' wage components together with NREGA is likely to create enough leverage and leeway for providing work throughout the year to a rural household. The absolute volume of the pooled fund would be substantial and so even if the present NREGA stipulation of 60% fund allocation for wage payment purposes be reduced to 50%, there would not be any dearth for wage-fund provided the pooled fund is disbursed in specific installment and time of the year.

Modifications Needed in Present NREGS Guidelines

According to the existing rules of the NREGA act, in case of failure to provide jobs to the applicants within a radius of 5 km, provision of job has to be made within the block area with a 10% excess charges for to and fro journey. Again in case the district programme coordinator fails to arrange for job within 14days of application, the applicant is deemed fit to receive unemployment doles from the Govt. Such kind of provision is obviously supposed to have a drain on the public exchequer. In case of a unique programme the same money slated to be used for giving contingent doles, may be merged with the SGSY fund to be offered in part, to failed job seekers for some of their productive occupations and thus creating rural assets. This sort of merging might go a long way in preventing unproductive leakage of NREGA funds.

Again according to NREGA no project can be launched which involves an investment of less than ₹ 50000. In terms of stipulation little bits of activities like land development, irrigation or minor other works together costing more than ₹ 50000 can be undertaken as a consolidated project. However this condition in the NREGA seems grossly imprudent and conniving to the need of small bits developmental works in areas which otherwise do not perceive the necessity of such big ventures. The stringency of this condition may lead either to unutilsed fund for lack of finding such consolidated

projects or misuse of funds due to sheer purpose of utilizing it despite no such immediate need. Under integration of the schemes and allowed flexibility, small-bits of needed projects can be undertaken in genuinely necessity areas while channeling the excess fund to promote and providing financial assistance for productive SHG activities which also cater to employment creation.

Expected Benefits of the Unified Programme

Sometimes the funds earmarked under a specific scheme may not be possible to exhaust either because of lack of foreseeable projects or lack of viability of some projects that are beyond renovation. Under integrated fund management, funds from aforesaid scheme may be channelised for utilization in other spheres with good pace of work, which might be suffering midway from lack of adequate funds.

Under existing system, there is acute shortage of staff for doing office work related to NREGA scheme. For instance the task of additional sahayak in Panchayat office, is to work only for NREGA scheme. Technically he cannot be coerced for doing work under other schemes. However under a unique scheme he would officially remain responsible to do work of diverse types and nature.

One major drawback of NREGA scheme experienced through field level investigation is the perceived problem of delayed payments on the part of a number of stakeholders. According to present stipulation, payments should be made within 15 days of performing work. In case of 100 days work programme, jobs are demanded through form no 4-A and are provided through form no 4-B. After providing work to some gram sansad, measurement of work is done. This is followed by placing demand for fund from upper layers of administration. However sometimes there is a great delay in receipt of such funds by the Panchayat office from the district authority, which is also chain linked to higher levels in having the belated channeling of grants. The lack of smooth and timely payments sometimes mars the very purpose of ensuring a secured livelihood and alleviating the pangs of poor village folk. Again people become skeptical and form a wrong idea about the efficacy of such programmes and this often makes them reluctant to participate in it. Under a common and singular fund management, there can be better assurance of uninterrupted flow of funds for payments within the stipulated period of 15 days. This is because in exigent situations like shortage of funds for an urgent purpose, funds hitherto granted and sometimes left unused in other less important programmes can be channelised to plug the loopholes of delayed payments. This would generate peoples' confidence in such job programme and also check the tendency of rural–urban migration.

The BRGF fund is till now meant for developmental use in specific backward regions and there are marked schemes like establishment of SSK buildings, ICDS building, drinking water sources where such fund can be channelized. However allocation of BRGF fund in regions where most of such projects stipulated under BRGF scheme have already been implemented, further fund allotment may turn out to be meaningless. With right to flexible use of such fund, that may be possible under a unique fund

management system, excess fund in one component use may be transferred to some other fund starved areas with proper guidance and priority based plan setting under the local bodies. Again in case of IAY scheme an individual in the BPL list usually can half construct his house with the first installment of fund granted to him. The 2nd installment can be claimed only on submission of necessary documents after spending the first installment money. However often the beneficiary confronts disadvantageous condition due to delay in the grant of 2nd installment. This is because the dismantling of his erstwhile abode makes him seek shelter in other place while the incomplete house is deemed unfit for stay. Again the half-built house may sometimes develop cracks, stains or other problems because of lying open for long. Under unique fund management and certain degree of flexibility, 2nd installment fund for IAY can be provided from fund so long slotted for other schemes.

Further the pooled scheme may give rise to various benefits in implementing the programmes. The previous problem of inadequacy of NREGA fund often encountered while starting a project may be substantially allayed in the new arrangement. Thus in case of constructing a concrete road the fund for material may be used from what would have been obtained from previous 2nd State Finance Commission (SFC), labour wages from what would have been got from previous NREGA scheme. Hence the insufficiency of NREGA fund in bearing material cost can be replenished by the pooled component of Finance Commission part. Again in case of bigger projects like (say) digging a pond for fish culture, labour charges can be given from what would have been available under erstwhile NREGA scheme, medicines from BRGF while management of the pond may be done with fund that would have been partially available in SGSY scheme. The pooled fund thus might lead to better and improved resource generation and creation of productive employment.

Steadiness and continuance of the developmental programmes emerging out of integration and consolidation of a number of ongoing schemes would significantly facilitate supervision and monitoring at the field level. At present NREGA constitutes the single largest employment providing scheme to rural households. Now in a condition of refused employment despite peoples' demand (because of inadequate fund) it may be awesome to undertake monitoring activities of other schemes because of peoples' vengeance due to remaining unemployed. In a pooled programme, interruption in the condition of employment can be avoided due to lumpy character of the fund with allowed degree of fund diversion while programmes under hitherto different schemes can be merged and carried out simultaneously. In such a situation rural people are likely to remain satisfied and monitoring and supervision activity can be carried on without unrest. There would be advantage in implementing the MIS (Monitoring Information System) under a single unified scheme with increased degree of transparency. Further consolidation of these schemes would give rise to more contingent funds, allowing for engagement of additional manpower and additional supervisory infrastructure as permissible under NREGP now. The transparency norms imported from NREGS shall ensure that the common public remain duly informed and participate at various levels of planning and execution of the schemes.

The rules and regulations of various schemes are different. Difficulty often arises in making the elected members of the panchayats assimilate these separate regulations of diverse schemes. Again the people associated with implementation of the programmes at the sansad level, being low educated, often find it complex to work out their jobs due to differences in the management process of different schemes. Under a single overarching scheme with uniform rules and regulations for different components, it would be rather easy for the panchayat level officials to understand the regulations leading to speedy implementation of the component programmes. As a result they would be in a position to prepare the necessary documents rather quickly. This would also ensure fuller utilisation of the earmarked fund for the respective component programmes.

Table 3. Consolidation Possibilities of Fund Allotted for Similar Purposes

Programmes	Components	Activities
NREGA (MORD)	Wages, Material	Water conservation/Harvesting, Drought Proofing, Irrigation canal, Irrigation Facility to SC/ST/BPL/IAY, Renovation, Water Bodies, Land Dev., Rural Connectivity
Watershed Programme (MORD+MOA)	Wages, Material	Watershed
RKVY (MOA)	Wage, Material, Training	Agriculture and Development of rainfed area
NHM (MOA)	Wage, Material, training	Water conservation/Harvesting, Drought Proofing, land development
BRGF (MOPR)	Material, training	All Activities
PMGSY (MORD)	Wage, Material, training	Road
Artificial Recharge of Ground Water through Dug well MOWR	Wage, Material, training	Water Resource Development
NFSM (MOA)	Training and subsidies	Agriculture
National Afforestation Programme MOEF	Training and subsidies	Forest and Environment

Source: Report of the Task Force on Convergence (2008)

Further auditing of a single programme with uniform guidelines relating to fund management and account keeping may be far moreeasier than under multiple schemes having diverse guidelines. This would also lead to quicker preparation of the single utilization certificate and sending it to the higher authority, thus making the way for smooth flow of next installment. Again the present system requires dissemination of information about performance under different schemes in separate nameplates. This often creates confusion in the minds of villagers and removing the necessity of placing

plates for individual programmes can both save cost and bring transparency into the system.

The guidelines of different ministries have provision for imparting organized training to the functionaries of various schemes. This compartmentalized training system fails to recognize the organic link among different programmes. So it is felt imperative to organize the training in such a manner that the functionaries be imparted with specific skills and motivation to achieve a coordination and convergence in implementation of the programmes by mobilizing manpower and resources of related component sectors. Under a consolidated unique programme, training fund of different schemes can be pooled together for effectuating an integrated and holistic training programme.

Apart from this, this process would enable undertake collective planning and eliminate delay in implementation of projects through different stakeholders, thus leading to enhanced social capital, improved management and better work effort. It would also promote quick creation of durable capital and improve land productivity.

Further the consolidated fund would facilitate ecological synergy in the form of better natural resource regeneration through diverse actions like watershed management, drought- proofing, afforestation, irrigation etc. The table-3 provides an exemplary view of consolidating the funds under different programmes targeted for similar purposes. Projects with the same activities indicate possibilities of clubbing the funds under the respective programmes shown on the extreme left column. After identifying the similar purpose funding provisions in diverse programmes and consolidating them as a singular component, it may be included in terms of certain percentage allotment under a single overarching programme. Similar actions may be done for identifying other component programmes before including them in terms of stipulated percentage allotment under the overarching main programme.

Table-4 indicates the programmes whose funds can be consolidated with several other complementary programmes.

Under the single programme, economic opportunities would be broadened through continuous and better employment and income prospects, generation of savings and investment outlets. In the process the consolidated fund under a single programme is likely to promote sustainable development through creation of better durable asset, rural connectivity, productivity enhancement and capacity development.

Advantage in Forming a Single Annual Action Plan

To achieve the goal of a total or holistic development from the point of view of investment planning, three stages of investment planning are followed viz. investment plan for GPs, investment plan for the block itself and investment plan for the block from Zilla Parishad (Z.P) head. It is expected that investment planning in each G.P under the decentralized planning structure would conform to the following principles viz. (a) principle of participation (b) principle of self dependent development and (c) principle of additionality.

Table 4. Possibilities of Consolidation of Several Programmes with Some Complementary Programmes

Programmes	Coordinator	Implementing Agency	Planning*	Complementarity with
NREGS	DC	GP	BU(PRI)	BRGF/IWDP/ RKVY/PMGSY/
Watershed Programmes	DC	WUG	BU(PRI)	NREGA/BRGF/MI
BRGF	DC	GP/ULB	BU(PRI)	NREGA/IWDP/ RKVY/PMGSY/
NRHM	DC	GP	BU(PRI+ULB)	All activity
PMGSY	DC	District	TD (District)	Use contractor/ NREGA/ BRGF
Water Resource Schemes (AIBP,CAD & WM, RRR & Flood control schemes)	DC	District	TD (District)	NHM/ NREGS/ IWDP
NFSM	DC	District	TD (District)	NREGA/ BRGF/MI
NRHM	DC	GP	BU(PRI + ULB)	All activity
Adult education & skill development (Merged schemes of NGOs/JSS/ SRCs)	DC	GP	BU(PRI + ULB)	All activity
RKVY	DC	District	TD (District)	NREGA/ BRGF/MI
NHM	DC	District	TD (District)	NREGS/ MI
NAP		Forest Dept.	JFM/TD (district)	NREGA/BRGF/NHM/

Source: Report of the Task Force on Convergence (2008).

The first two visualizes the process of participatory planning at grass-root level for the integrated components divided under 4 major sector heads like economic sector,

infrastructure sector, social sector and service sector. However, with the spread of the culture of specialization and sectoral component specific thrust in development, the different line departments issue guidelines for preparation of specific development plans like district health plan, district education plan, district water and sanitation plan, district agriculture development plan, district rural road development plan etc. But to attain the objective of using the local resources more efficiently and in a coherent manner, it is imperative that vertical planning process be transformed into a horizontal planning process whereby local governments be actively involved with other planning bodies to work out together an implementable plan.

In order to promote horizontal planning process at various local governments' level, the present guidelines of different departments need to be modified to bring uniformity in planning, sanctioning, release of funds, implementation, monitoring and evaluation of the programmes. Broad procedures and processes are similar in many of such programmes with a great deal of overlaps. However the approval system and implementing agencies are different. Although present guidelines of different schemes advocate inter-programme coordination and convergence, there is hardly any such incident of inter-departmental consultation. The sectoral departments are reluctant to transfer their funds for projects emerging from other component programmes. There is a lurking fear among not only officials but also non-officials of losing control over 'their' departmental resources. In the absence of institutional mechanism for ensuring convergence, departmental functionaries often raise questions as to the feasibility of planned convergence as the resources may be controlled by some agencies outside the fold of the main convergence seeking programme. There are also differences in norms of subsidy/target groups and accounting procedures which introduce conflicts and intricacies in the mechanism of planning for convergence. Double recording of works in overlapping schemes is a major problem in the convergence. At present there exists no mechanism to cross check the records of various departments.

Sometimes it may be a great problem in having the information on funds availability. Committed fund flow under various schemes/component programmes is either not known a priori or there may be an apathy to provide the prior information, which stand in the way of a feasible convergence exercise. Only in case of NREGS funds are disbursed in a planned manner while this is not so for other schemes. There is no guarantee about the flow of definite funds for these different other schemes. Hence great problem is encountered in making annual action plan under different schemes because of the dilemma about the future fund flow. Following the present guidelines, separate plans have to be made for different schemes some of which have also overlaps. The problem of causing a convergence among some related and overlapping schemes can be solved if there be a single consolidated programme with earmarked percentages for different sectoral component heads with no overlaps. In order to effectively address the issue of poverty alleviation, there is great need to optimize efforts through coordinating funds with inter-sectoral overlaps under one common programme. Suitable coordination of funds slated for similar work categories identified under different programmes like NREGS, watershed programme, NHM, accelerated irrigation benefit programme, BRGF,

command area development and water management programme scheme for repair, renovation and restoration of water bodies (RRR), NRHM etc. would help earmark certain percentage of fund for each component under the unique fund programme. There should of course be some degree of flexibility in fund diversion. The assurance of consolidated fund flow at the beginning of the financial year committed to each G.P with stipulated percentage under each sectoral component head, would greatly facilitate implementation of the unified programme. This would also help bringing in uniformity in the accounting procedure thus allaying the problem of double counting across different component programmes. In that case, a single annual action plan would suffice the purpose of development. This would also ensure timely implementation of the coordinated programmes.

Each Gram Panchayat need to be given certain amount of the pooled fund at the beginning of the year. Under the present system often funds are disbursed at times when the actual necessity has vanished. This sometimes leads to substantial grants remaining unutilized. In case a part of the pooled grant be provided at the beginning of the financial year with assurance of payment of the residual fund at specified intervals, it may greatly facilitate the implementation of the component programmes. One may form an idea about the needed grants in a Panchayat in a year by having a look at last 3-4 years statistics. Thus if each Panchayat estimates its necessary fund sufficiently ahead of the beginning of a financial year and places it at the block level and if all such Panchayat level estimates are clubbed together at each respective block before being finalized at the district level, then the granting authority may be apprised of the needed fund across each respective district and hence the state in a systematic manner. Assured pooled fund grant with earmarked percentages for each component provided by such authority to each Panchayat at the same time in each year may facilitate the prior drawing of development plans by the local self governing authority. This would also enable them to spend the money in a planned way with certain degree of allowance for adjustment whenever felt necessary. The plans should be based on data of local available resources, opinions of local people, their felt needs, facilities and of course should have a seasonal structure. This would enable prior creation of a programme bank. Different type of works to be undertaken at different time/season of the year would be clearly delineated in this bank. These would have to be implemented in suitable time and opportunities. There could however be a priority list among the season based programmes, to be decided by the local self-government e.g., Gram Sabha, according to which the respective works should be undertaken (NREGA Report II, 2009). All these steps would obviously ensure better fund utilization and accelerate the development process.

Suggestions for Improvement in NREGS as a Model for the Integrated Programme

(a) Gram Panchayats should be provided with more power for execution and effective supervision along with certain degree of flexibility in fund diversion.

(b) NREGS should be extended to educated youth (post metric) for mobilizing them in creating social awareness about literacy, sanitation, health care, balanced nutritional diet, anti liquor, family planning, child care and removing child labour.

(c) There is needed expansion in the permissible areas of work including house construction, compost/soak pits, kitchen gardens, and services like cleaning public places, care of elderly or chronically ill, bare foot extension workers, skill development etc. The plausible reason is that the present scope of NREGS cannot be sustained beyond certain point as we cannot continue constructing water harvesting, minor irrigation, flood proofing or digging pond etc., because of limited land mass. Further once such works in specific areas reach a point of saturation, focus needs to be shifted to alternative jobs.

(d) The present NREGS practice of having provision of jobs on demand by any person need to be removed. With a revised BPL list, genuine poor persons may be enabled to take advantage of NREGS job cards and the present practice of keeping provision of job from DM to PM can be removed. There need to be a system in which economically better-off people might be put to shame in case of demanding for jobs. For the revamping of the process, BPL survey should be conducted on the basis of proper scrutiny of land related records taken out from land revenue office. Educational status should not be any criterion for being enlisted as BPL. Further with a pooled fund there may be obtained a substantial wage component (due to clustering of wage components of a number of infrastructure related fund) with which continuous employment for more than 15 days can be provided without any great concern for depletion of funds. At present in many cases, the inadequacy of granted fund incommensurate with demand, often stand in the way of providing continuous employment for more than 15 days.

(e) For health care service, there is an area of convergence between NRHM initiatives and NREGA, specially for the women workforce. Since women in NREGA mostly come from poor rural households, their work productivity is affected by their physical health. Lower physical status affects their work turnout and lower earning aggravating a vicious cycle of lack of economic resources and lack of well being. Part of funds of NRHM should be earmarked for this target group.

(f) The present practice of payment according to piece-rate work disqualify women to earn at par with men, since they can hardly equal the physical strength and stamina exercised by male counterparts. Hence to obtain more female participation in wage jobs and ensure concomitant empowerment, it is required that the piece-rate payment be somewhat raised compared to males and accordingly their felt discrimination be tangibly reduced. The pooling of funds under a single programme might provide substantial amount in a single slot and so somewhat enhanced payment to females might be possible without feeling any fund crunch.

The aforesaid modifications, alterations and unification of the schemes are supposed to go a long way in better catering to the multiple benefits of the underprivileged and deprived sections of the society.

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Appendices

List of Abbreviations

AABY	:	Aam Admi Bima Yojana
BCW	:	Backward Class Welfare
BDO	:	Block Development Officer
BRGF	:	Backward Region Grant Fund
CHCMI	:	Community Health Care Management Initiative
DPAP	:	Drought Prone Area Programme
DC	:	District Collector
DM	:	District Magistrate
FC	:	Finance Commission
GPMS	:	Gram Panchayat Management System
IAY	:	Indira Awaas Yojana
ICDS	:	Integrated Child Development Scheme
IGNOAPS	:	Indira Gandhi National Old Age Pension Scheme
IWDP	:	Integrated Wasteland Development Project
MOA	:	Ministry of Agriculture
MOEF	:	Ministry of Environment and Forest
MOH	:	Ministry of Health
MORD	:	Ministry of Rural development

MPLAD	:	Member of Parliament Local Area Development Scheme
MSDP	:	Multiple Scheme Development Programme
NBFS	:	National Family Benefit Scheme
NHM	:	National Horticulture Mission
NREGA	:	National Rural Employment Guarantee Act
NREGS	:	National Rural Employment Guarantee Scheme
NRHM	:	National Rural Health Mission
OBC	:	Other Backward Classes
PM	:	Prime Minister
PMGSY	:	Pradhan Mantri Gram Sadak Yojana
PRI	:	Panchayat Raj Institution
PROFLAL	:	Provident Fund for Landless Agricultural Labourer
PUP	:	Paschimanchal Unnayan Parshad
RKVY	:	Rashtriya Krishi Vikas Yojana
SDO	:	Sub-Divisional officer
SGSY	:	Swarnajoyanti Gram Swarojgar Yojana
SRD	:	Strengthening Rural Decentralization
TSC	:	Total Sanitation Campaign
ULB	:	Urban Local Body

9

Genetic Improvement of Pulses through Induced Mutation

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Abstract

The global population is continuously increasing and is expected to reach nine billion by 2050. This huge population pressure will lead to severe shortage of food, natural resources and arable land. Such an alarming situation is most likely to arise in developing countries due to increase in the proportion of people suffering from protein and micronutrient malnutrition. India has the distinction of being the top producer of pulse production in the world. Pulse plays an important role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. Pulses being a primary and affordable source of proteins and minerals play a key role in alleviating the protein calorie malnutrition, micronutrient deficiencies and other undernourishment-related issues. Additionally, pulses are a vital source of livelihood generation for millions of resource-poor farmers practising agriculture in the semi-arid and sub-tropical regions. In spite of its several attributes, the crop suffers a great loss because of several production constraints. Limited success achieved through conventional breeding so far in most of the pulse crops will not be enough to feed the ever increasing population Mutations induced by radiation or chemicals provide variation in plant structure and function from which breeders can select plants having useful traits. Induced mutations are a proven tool in creating a wealth of desirable genetic variability in plants and can be a catalyst in developing improved crop varieties with nutrition quality and higher-yield.

Keywords*: Pulse, induced mutation, genetic variability, improved germplasm*

Introduction

Pulses are the basic ingredient in the diets of a vast majority of the Indian population, as they provide a perfect mix of vegetarian protein component of high biological value

when supplemented with cereals. Pulses are also an excellent feed and fodder for livestock. Legumes are endowed with the unique property of biologically fixing atmospheric nitrogen via symbiosis, making them an integral component of sustainable agricultural production systems (Zhu *et al.* 2005). In the family Fabaceae, grain legumes or pulses are particularly important in supplying adequate quantity of lysine-rich protein to humans, thereby complementing the conventional cereal-based carbohydrate-rich diets, which are otherwise deficient in lysine and tryptophan (Broughton *et al.* 2003; Ufaz and Galili 2008). Additionally, pulses are potential sources of several essential minerals, vitamins and secondary metabolites like is flavonoids in human diets (Cannon *et al.* 2009). Concerning protein deficiency, it is important to emphasize that globally over one billion people are currently suffering from protein and micronutrient malnutrition (Godfray *et al.* 2010). In this context, pulses by virtue of their high protein, vitamin and mineral content play a crucial role in alleviating micronutrient deficiencies, undernourishment or protein calorie malnutrition (PCM), especially in the less- developed countries (Broughton *et al.* 2003).

In terms of worldwide pulse production, a total of 70.41 million tons (m t) are harvested annually from 77.5 million (m) ha area with a productivity of 907 kg/ha (FAOSTAT 2012). Almost 90 % of the global pulse production (62.98 m t) is shared by major pulse crops, viz. dry beans (mainly common bean), chickpea, dry peas (pea), cowpea, pigeonpea, lentil and faba bean. Based on their adaptability to tropical and temperate agro-climatic conditions, these pulse crops can be categorized into two distinct groups, i.e. (1) warm season crops (common bean, pigeonpea and cowpea) and (2) cool season crops (pea, chickpea, lentil and faba bean) (Cannon *et al.* 2009; Young *et al.* 2003; Zhu *et al.* 2005). Interestingly, chickpea, pea and lentil are among the founder grain crops, which experienced domestication early in pre-history (c. 11,000 years ago), and these paved the way for establishment of modern agriculture (Zohary and Hopf 2000). The pulse crops have always been a key contributor to maintaining sustainability of the farming systems in the semi-arid and sub-tropical world and in generating livelihood and food security to millions of resource-poor people inhabiting these regions (Broughton *et al.* 2003).

Owing to their immense agricultural value, exhaustive research has been done for pulse improvement through conventional breeding, resulting in the development and release of several high-yielding varieties (Gaur *et al.* 2012), followed by an increase in the global area under pulses from 64 to 77.5 m ha over the last 50 years (FAOSTAT 2012).

Global Scenario of some pulses

Black gram or urdbean (*Vigna mungo* (L.) Hepper) is a highly self pollinated crop with cliestogamy up to 42% (Puneglov, 1968). It is cultivated in *kharif* (rainy season) as a mixture with cereals, pigeonpea *etc*., in *rabi* and *zaid* (spring and summer) as pure culture. The average yield of urdbean is very low (575 kg/ha) in comparison to major grain legumes like chickpea and pigeonpea. India is the largest producer of urdbean

contributing 1.75 million tonnes annually from an area of about 3.20 million ha. Urdbean occupies about 14% of the total area under pulse crops in the country and ranks fourth in area and production after chickpea, pigeonpea and munghbean. Major urdbean producing states in the country are Andhra Pradesh, Maharashtra, Uttar Pradesh, Madhya Pradesh, Tamilnadu, Rajasthan, Karnataka. The area, production and productivity of urdbean along with the total pulses during the last ten years are given below (Table 1).

Table 1. Area, production and yield of urdbean and pulses

Year	Area(m ha)		Production (m tones)		Yield (kg $^{-1}$ ha)	
	Pulses	Urdbean	Pulses	Urdbean	Pulses	Urdbean
2002-2003	20.50	3.55	11.13	1.47	543	415
2003-2004	23.46	3.42	14.91	1.47	635	430
2004-2005	22.76	3.17	13.13	1.33	577	419
2005-2006	22.39	2.97	13.39	1.25	598	463
2006-2007	23.19	3.10	14.20	1.44	612	526
2007-2008	23.86	3.24	15.10	1.46	638	440
2008-2009	24.54	3.11	14.66	1.31	597	425
2009-2010	23.28	2.96	14.66	1.23	630	418
2010-2011	26.40	3.26	18.24	1.74	691	534
2011-2012	24.78	3.20	17.21	1.75	694	575

Source: Department of Agriculture and Co-Operation, Ministry of Agriculture.

Cowpea *(Vigna unguiculata* (L.) walp.), also referred to as black-eyed pea, crowder pea or lobia, is a self-pollinating diploid (2n = *2x* = 22) species with an estimated genome size of 620 Mb (Chen et al. 2007). It is an important warm season grain legume cultivated in ~30 countries (Singh 2005). Interestingly, more than 80 % of dry cowpea produce comes from three countries (Niger, Nigeria and Burkina Faso) of west-Africa that cover nearly 83 % of the global cowpea area (FAOSTAT 2012; Popelka *et al.* 2006). Therefore, cowpea remains the primary source of income for small-scale farmers practising agriculture in dry Savannah of sub-Saharan Africa. Furthermore, cowpea also provides a cheap and highly nutritious feed for livestock in tropical west and Central Africa (Kamara *et al.* 2012). Globally, cowpea has shown an increasing trend in its cultivation area from 2.41 m ha to 10.68 m ha over the last five decades (FAOSTAT 2012).

Pea *(Pisum sativum* L.) is a self-pollinating crop with 4,063 Mb genome organized into seven pairs of homologous chromosomes (2*n* = 2*x* = 14) (Arumuganathan and Earle 1991). Worldwide, a total of 9.86 m t of dry peas is harvested annually with exceptionally high productivity (1,558 kg/ha). The three major pea producers, i.e. Russian Federation, Canada and China, collectively contribute around 56 % (5.57 m t) and 54 % (3.39 m ha) to the global production and area, respectively (FAOSTAT 2012).

Lentil *(Lens culinaris* Medik.) is a self-pollinated diploid ($2n = 2x = 14$) crop with a large genome size (4,063 Mb) (Arumuganathan and Earle 1991). From the standpoint of global production, lentil stands fifth with 4.55 m t being produced annually from an area of 4.24 m ha (FAOSTAT 2012). Major lentil-growing countries are India, Australia, Canada and Turkey, together producing more than 73 % of the world's lentil (FAOSTAT 2012). Due to higher protein content and better digestibility, lentil contributes to nutritional and food security for the people in the northern temperate, Mediterranean and sub-tropical savannah regions (Sharpe *et al.* 2013).

Faba bean *(Vicia faba* L.), also known as broad bean or horse bean is cultivated in about 60 countries covering a total of 2.43 m ha area with an annual production of 4 m t (FAOSTAT 2012). Worldwide, China (0.95 m ha), Ethiopia (0.45 m ha), Morocco (0.18 m ha) and Australia (0.16 m ha) are the main faba bean-growing countries. China alone produces 35 % (1.4 m t) of the global dry faba beans followed by Ethiopia (0.71 m t) and Australia (0.42 m t). It is a dual-purpose crop, which not only provides inexpensive proteins for human consumption (particularly in western Asia and northern Africa), but also serves as a prime livestock feed in Europe and Australia (Alghamdi *et al.* 2012). Notwithstanding the higher productivity of faba bean (1,666 kg/ha), the global area under faba bean cultivation has declined over the last five decades (FAOSTAT 2012).

India, Pakistan, Myanmar, Bhutan, Bangladesh, Thailand, Malaysia, Philippines, Afghanistan, China, Indonesia and Iran are the major mungbean and urdbean producing countries. In India, almost all production is consumed domestically and world trade is dominated by countries from Southeast Asia. In India, the major sources of import of mungbean and urdbean are Myanmar, Thailand and China.

Constraints of Pulses Production

The major constraints in achieving higher yield are lack of exploitable genetic variability, absence of suitable ideotypes for different cropping systems, poor harvest index, and susceptibility to biotic and abiotic stresses, besides non-availability of quality seeds of improved varieties. Moreover, cultivation in low priority area, inadequate plant protection measure, poor crop management practices are the other constraints behind the low productivity. Shortfall in pulses has also been attributed to a number of factors, the major ones being the increasing population, rising income, geographical shift, abrupt climatic changes, socioeconomic conditions and poor marketing opportunities.

Strategy for Improvement of Pulse

It has been amply demonstrated that good agronomic practices alone can lead to increase in yield to the tune of 25-40%. However, development of efficient production technologies is further required with special emphasis on inter-cropping. There is also a need to develop appropriate production technologies for non-traditional areas and the cropping systems involving pulses, i.e. relay cropping rice fallows, summer/spring cultivation. Since the availability of labour for farm operations is reducing and cost of

labour is increasing, there is need to develop crop management technologies for reducing the cost of production. Efforts are also needed to develop production technologies with innovative plant geometry to harness the energy sources. Insulation of crops against biotic stresses is most critical in enhancing crop productivity. Pulses have tremendous scope for area expansion. Short-duration varieties of pulses can fit well in various cropping systems. Compared to cereals, yield breakthrough in pulses has not been achieved, although breeding efforts in the past were rewarding in terms of insulation of varieties against major diseases (bringing stability), reducing crop duration (promoting crop diversification and intensification) and improving physical grain quality (seed size and colour). For a major breakthrough in yield, there is urgent need to broaden the genetic base by strengthening pre-breeding and developing core sets of germplasm; harnessing hybrid vigour through genetic improvement.

The high efficiency of mutation techniques to generate desired variation in crop plants has been widely proven and well documented in many original and review papers. In the approximately 80 years old history of induced mutations, there are many examples on the development of new and valuable alternation in plant characters significantly contributing to increased yield potential of specific crops. More than 3200 mutants varieties have been officially released from 224 different plant species, and these thousands of plant mutants were produced mainly by physical mutagens (IAEA, 2012).

Improvement through Mutation

Substantial reduction in crop duration coupled with photo-thermo insensitivity and synchronous maturity, resistance to key diseases, and improved seed size should be the most important breeding goals in pulse improvement. Mutations induced by radiation or chemicals provide variation in plant structure and function from which breeders can select plants having useful traits. So, there is an urgent need for genetic improvement of the crop and development of superior varieties through induced mutagenesis, which could buffer the yield against adverse conditions. Gustafsson (1947) advocated that mutation approach was superior to other methods of crop improvement for generation of genetic variability. Mutations provide an opportunity to create hitherto unknown alleles, so that the plant breeder does not remain handicapped due to limited allelic variation at one or more gene loci of interest. Today, the plant breeders have at hand, a number of effective physical and chemical mutagens capable of inducing variation when applied properly. Physical mutagens, specially the ionizing radiations have been widely and routinely used to generate genetic variability in various crop species including pulses (Tomlekova, 2010). It has been demonstrated that induced mutation can increase yield as well as other agronomic characters such as stiffness of straw, time of maturity, adaptability, shattering resistance, disease resistance, protein content, baking quality, malting quality and numerous other characters (Borojevic, 1990; Brunner, 1991). Mutation breeding generally targets those traits that have either not been favoured by natural selection in the evolutionary process or have not been improved during previous plant breeding efforts. Sigurbjornsson and Micke (1974) have shown the increasing role of induced mutation in crop improvement. The most important aspects of mutation

breeding have been the quick rectification of defects in varieties and advanced breeding lines, induction of polygenic mutations and development of ideotypes for various agro-climatic conditions. One of the greatest drawbacks of mutation breeding, however, is the undesirable effect produced by the pleiotropic action of the mutant gene or simultaneous mutation of closely linked genes. It is a fact that most of the induced mutations are deleterious, but when appropriate selection technique is applied, useful mutants can be recovered. Nevertheless, the occurrence of even a few desirable mutation in high yielding varieties has the great advantage of becoming homozygous and expressing its superiority within a couple of generations after induction in M_2 or M_3 as compared to F_6 or F_7 generations in case of hybridization.

Thus, induced mutations can provide useful alternative or complement to natural variation as well as to hybridization. Induced mutations may be similar to those, which occurred naturally or many of which, probably, have never occurred spontaneously or have been lost from the natural population. By applying appropriate selection techniques, desirable mutants suitable for modern agricultural system could be retained (Brock, 1971). According to Kharkwal and Shu, (2010) more than ₹ 258 crores of income was generated by India due to release of 343 mutant cultivars belonging to 57 plant species. Detailed information regarding number of mutant varieties released for cultivation in India and total number of varieties released in pulse crop is presented in Table 2. Some popular mutant varieties which are cultivated in India are mentioned in Table 3.

Table 2: Mutant varieties of pulse crops released for cultivation in India

Crop	No. of varieties	Specific crop and no. of varieties
Pulses	57	Mungbean(15), blackgram(9), chickpea(8), cowpea(10), mothbean(5), pea(1), pigeonpea(5), frenchbean(1), lentil(3)

Source: Kharkwal and Shu, (2010)

Table 3: Some Popular Mutant Variety Cultivated in India

Common name	Latin name	Mutant cultivar
Blackgrame	*Vigna mungo*	TAU 1,TU 94-2, Manikya, DU-1
Cowpea	*Vigna unguiculata*	V-16 (Amba)
Mungbean	*Vigna radiate*	TAP-7, MUM-2, BM-4, LGG-409, LGG-450, Co 4, Dhauli, Pant moong-1, TM 96-2
Chickpea	*Cicer arietinum*	Pusa-547, Pusa-408 (Ajoy), Pusa-413 (Atul), Pusa-417 (Girnar)

Conclusions

Induced mutations will also play an increasing role in creating crop cultivars with traits such as enhanced uptake of specific metals, deeper rooting system, tolerance to drought and salinity, and resistance to diseases and pests as a major component of the environmentally sustainable agriculture. In determining the value of a derived mutant cultivar, based on the area planted to the cultivar or from the value of the crop produced or processed into a product, it must be recognized that this value includes the contribution of many other genes introduced with recombination-based breeding as well as agronomic inputs, costs of packaging and processing. The mutant genes have added a significant part of this value. It is essential that these tools should become an integral part of regular pulse breeding programmes so that all the potential mutants which will be used directly as variety and/or indirectly in cross breeding programme through mutant and mutant (M×M), mutant & parent (M×P) and mutant and standard variety (M×SV).

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10

An Analysis on the Status of Empowerment of Women Related to Flower Vending Business with Special Reference to Kolaghat Flower Market, Purba Medinipur, West Bengal

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Abstract

Exploring the empowerment status of women is a complex phenomenon especially within the multi-cultural and regional society of India, and it remains the focus of interest for investigators. The authoritative position of women is mainly dependent on a series of many different factors particularly when subjects under study are from rural areas. This paper deals with two questions; the first is concerned with women empowerment related to the women flower vendors of Kolaghat flower market of Purba Medinipur District, West Bengal. The second question examines how this empowerment is affected by other socio-economic variables. In this backdrop, we measure women empowerment through the dimension index as propounded by UNDP, 2005. We also estimate a linear regression model to find out the major socio-economic determinants of the empowerment related to the women flower vendors. Results suggestedthe women related to flower vending business in Kolaghat flower market achieve and increases their level of empowerment through this job. The main factors affecting their level of empowerment are their respective income, their educational status, access to health and lastly the working hour in the flower market.

Keywords: *Women flower vendor, empowerment, dimension index, classical linear regression model*

1. Introduction

In recent decades there has been increasing in demand of floriculture products with increasing income. It is souring industry in Asian countries including India.

Floriculture is an emerging area with great potential both in the domestic as well as export market. In India, commercial floriculture is on-going development but have a long tradition of various types of flowers. Flowers have been representing in ancient painting, mural and coins. However, the social and economic aspect of flower growing recognized later. It is only in the last two three decades.

From 2001, there has been tremendous growth in floriculture production. In terms of area, production and export it can be seen extreme growth. All states in India have a tradition of growing flowers, commercial growing of flowers presently confined to Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal, Maharashtra, Rajasthan, Delhi and Haryana. In India, marigold, aster, roses, tuberose, gladiolus, are grown in open field while gerbera, carnation, roses, anthorium, orchids, etc., are grown under green-house conditions.

In this concerned, our state, West Bengal, is India's third largest flower producer after Karnataka and Tamilnadu. The production of cut flowers increased over the years to attain a production of 1,952 million flowers during 2002-07 from 615million cut flowers in 1992-97. West Bengal is a leading state that produced maximum number of flowers over the last decade. Flowers like rose, tuberose, champak, jasmine, china box, marigold, gladiolus, gardenia, carnation, gerbera, chrysanthemum, a significant portion of which is produced in West Bengal, have vast scope of its external and internal demand. Floriculture has emerged as a fast growing sector recently in West Bengal for diversification employment generation and value addition in the primary sector. West Bengal is a potential state blessed with highly conducive agro-climate conditions for floriculture. Though the history of growing flowers and ornamental plants is too old, the commercial trade on these have generated recently. These have been made possible for the boost of its exports, recent expansion of joint ventures by corporate sectors for exemption from custom duties on imported plant materials, reduction of duties on materials for green house, high subsidy on airfreight etc., due to impact of economic reform (1991-92), trade liberalization and global impact within the framework of WTO. Following these reforms, West Bengal has started commercial farming on a large scale from the mid 90's of the last century. As per the data available from the Directorate of food processing industries and Horticulture, Government of West Bengal (Sarker, 2001 and 2004), it is observed that the area under flower crop in West Bengal was 9.8 thousand hectares in 1996-97, but in 2002-03, it stood at 17.33 thousand hectares, registering around 9.8 per cent increase of compound growth rate per annum between 1996-97and 2002-03, whereas production growth was around 16.54 per cent during that period (Sarker and Chakraborty.2005;66). But the commercial flower farming is restricted to certain districts of the state (Government of West Bengal, 2001, cited in Chakraborti and Sarker, 2011): 5 districts-Midnapore (East), Howrah, Nadia, 24 Parganas (North), 24 Parganas (South)- mainly produce commercial flower crops in West Bengal in alluvial zone and Darjeeling district produces commercial flower crops in Hill Zone. (Sarker and Chakraborty. 2005; 67; Chakraborti and Sarker, 2011;199).

In this regard, flower vending as a component of marketing as well as a source of income in local markets to a number of people act as an vital ingredient of empowerment.

Now vending act as an important feature of the informal sector in India. Vendors are those traders who operate from the streets or occupy legally distributed stalls at a given area selling different goods (Mitullah, 2003; Cohen *et al.*, 2000). Therefore, the informal sector has also become the lifeline for many people in less industrialized nations, particularly in semi urban areas, in terms of employment provision since it is increasingly becoming the key mechanism for copying with the growing population (Mupedziswa, 2001).

Women, it has been noted, also take part in vending as a way of empowering themselves in a society that tends to be traditional and oppressive rather than liberal. This is because in many less developed countries (LDCs) when women depend on their husbands for financial assistance, they are placed in a weak bargaining position, as men assume a dominant role. Men often find themselves within the informal sector due to the negative effects of structural adjustment programmes (SAPs) that resulted in the downsizing of the civil service and the restructuring or closure of many companies (ILO, 2002). SAPs in many LDCs like India resulted in loss of employment and the shrinking of the formal job market, thereby creating conditions for the mushrooming of the informal economy.

In this regards, flower vending turns as an important source of Income for the women where the spatial conditions are in favour of floriculture. Though there exists gender earnings differentials in which women usually receive lower wage/income than man in the same occupation, and this is true across all occupations. However there is a little research on gender difference in work performance and empowerment issues and this is true across all occupation.

In this backdrop, this study seeks to analyse the overall empowerment of women through vending of flowers in East Midnapore district with special reference to Kolaghat flower market of West Bengal.

1.2. Objectives of the Study

1. To assess whether the women related to flower vending business is empowered.
2. To examine the main factors causing empowerment of the women flower vendors in Kolaghat flower market.

The rest part of the paper can be summarized as: Section 2 deals with the brief survey of literature. Section 3 describes data collection and research methodology. Results and discussion is presented in section 4. Section 5 deals with the conclusionary part of our study.

2. Brief Survey of Literature

In the development literature, women's empowerment can be understood as the ability of women to make effective choices. "If a person or group is empowered, they

possess the capacity to make effective choices; that is, to translate their choices into desired actions and outcomes." (Alsop and Heinsohn, 2005: p. 6). Empowerment comprises three interrelated components: resources, agency and achievements as the outcomes of making choices (Kabeer, 1999). According to Mishra and Tripathi (2011), resources include material, human and social resources that form the conditions under which women can make choices; agency refers to the ability to formulate choices, control resources and make decisions; and achievement is the outcome of empowerment from the enabling conditions. Both resources and agency relate to the social background of each individual woman, her past and current family settings, surrounding environments, and also the type of decisions. Hence, the meaning of empowerment is best understood in specific contexts (Malhotra and Schuler, 2005).

Empowerment differs from autonomy. The former can be understood as a process by which powerless women gain greater control over their lives (Sen 2001; Malhotra, and Schuler, 2005), while the latter is understood as the static status of independence in making decisions (Mishra and Tripathi, 2011). Factors that define these two concepts do not overlap completely. For instance, education has been considered separately from autonomy (Fotso *et al.,* 2009; Singh *et al.,* 2012) while constituting an important part of women's empowerment (Alsop and Heinsohn, 2005; Malhotra and Schuler, 2005; Mahmud *et al.,* 2012). Education forms cognitive conditions for women to formulate choices and helps them to gain financial independence and more power in making decisions. Similarly, employment is an important component of empowerment but generally used separately with autonomy (Fotso *et al.,* 2009). At the individual level, empowerment is exercised in multiple dimensions (Kabeer, 1999; Malhotra and Schuler, 2005); that is, women may be empowered in one dimension but not in others (Kishor, 2000; Mishra and Tripathi, 2011). For example, women involved in household financial decisions may not have sufficient power to make decisions related to healthcare, such as the use of contraception or professional birth delivery (Furuta and Salway, 2006). Several studies have attempted to capture various dimensions of empowerment using aggregate indicators.

Alsop and Heinsohn (2005) proposed to measure women's empowerment in three domains (state, market and society with each having sub-domains), and at three levels (local level—the immediate vicinity of a person's everyday life, intermediary level-between the residential and national level, and macro level—a vicinity which is the furthest away from the individual). Kishor and Gupta (2004) used indicators related to evidence of empowerment (participation in household decision-making and freedom of movement), access to potential sources (information, education, and employment), and setting for empowerment (circumstances of women's life and opportunities available to them). Mahmud *et al.* (2012) included demographic status (age), economic situation (household wealth), self-esteem, and control over material resources, and Malhotra and Schuler (2005) measured empowerment using indicators in five domains (economic, social and cultural, legal, political, and psychological) at three levels (households, community and broader arenas).

3. Datacollection and Research Methodology

For the collection of data, simple random sampling technique is used in our study. Data are collected through a primary survey followed by a questionnaire. Data are collected from the Kolaghat flower market under Purba Medinipur District, West Bengal. From around 300 women flower vendors, we consider its 10% i.e., 30 women flower vendor for our study. These flower vendors are surveyed with the help of a pre structured questionnaire. They are mainly asked the questions which highlight their economic, social and political empowerment after participating in flower vending business.

3.1. Empirical Model and Data Analysis

Though the impression of women's empowerment has long been legitimized by international development agencies, what actually comprises empowerment, how it is measured, and which dimension it comprises is debated in the development literature.There has consequently been a proliferation of studies attempting to measure empowerment, some seeking to facilitate comparisons between locations or over time, some to demonstrate the impact of specific interventions on women's empowerment and others to demonstrate the implications of women's empowerment for desired policy objectives. However, not everyone accepts that empowerment can be clearly defined, let alone measured (Kabeer, 2001). Different authors and researchers define and measure empowerment according the need of their work, place and socio-cultural situation of the area under study.

The frequently used Gender Empowerment Measure (GEM) is a composite measure of gender inequality in three key areas: Political participation and decision-making, economic participation and decision-making and power over economic resources (HDR: 2003 cited in Femida, 2004). It is an aggregate index for a population and does not measure Empowerment on an individual basis. It is made up of two dimensions: Economic participation and decision-making (measuredby the percentage of female administrators and managers, and professional and technical employees), and political participation and decision-making (measured by the percentage of seats in parliament held by women). For these purposes GEM is limited and does not capture the multidimensional view of women's empowerment. It cannot be assumed that if a development intervention promotes women's empowerment along a particular dimension that empowerment in other areas will necessarily follow. A number of studies have shown that women may be empowered in one area of life while not in others (Hashemi *et al.* 1996; Malhotra and Mather 1997; Kishor 2000b).

Friedmann's (1992 cited in Nazrul Islam et.al) model of empowerment involves local self-reliance, direct participatory democracy and experiential social learning. He suggests that external agents can play a role in providing support in ways that encourage the disempowered to free themselves of traditional dependency *(ibid)*. Comparable components of empowerment are also included in the eight indicators by Hashemi (1996): mobility, economic security, ability to make small purchases, ability to make

larger purchases, involvement in major decisions, and relative freedom from domination by the family, political and legal awareness, and involvement in political campaigning and protests.

Several different efforts have been made in recent years to develop comprehensive frameworks delineating the various dimensions along which women can be empowered (Malhotra *et. al.* 2002). A study conducted by Mark M. Pitt, *et.al.* (2006) in Bangladesh and a study conducted by Sara Noreen (2011) in Bahawalpur Pakistan uses score index to measure empowerment and, In their approach, answers to different questions are weighted and summed to form one universal "score" that represents empowerment. For example, a "yes" answer to each of 10 questions may be coded as one and a "no" as zero; then these ones and zeros are added to produce an index with a minimum of zero and a maximum of 10.

Building on the works of Hashemi *et. al*, (1996) and Amin Becker and Bayes, (1998), Malhotra, *et. al*, (2002), the study will use a four comprehensive component of dimension of women's empowerment, economic empowerment index, household (family) empowerment index, political empowerment index and personal empowerment index that draws from many authors mentioned earlier, as their work is more relevant with the rural areas particularly with rural woreda's of harari region.

Kishor (2000) argues that capturing the empowerment process with cross-sectional data requires indicators that evaluate the end product of the process (i.e., indicators that measure evidence of empowerment), as well as indicators of women's access to different sources of empowerment and of women's location within an appropriate setting for empowerment. In their study, Malhotra *et al.* (2002) synthesized and listed the most commonly used dimensions of women empowerment. They categorized women empowerment into six dimensions such as economic, socio-cultural, familial/ interpersonal, legal, political and psychological. From their inventory of universally used dimension and indicators, they found that the most universally used indicators are decision making power and access to resources) find that the variable of decision-making is generally measured by looking into women's decisions on finances, resource-allocation, spending, expenditures, social matters and domestic matters and child-related issues. Women's access to resources is generally measured by considering women's access to and control of cash, household income, assets, unearned income, welfare receipts, household budget and participation in paid employment.

But due to lack of data on the aforementioned variables and lack of complete measures of women's empowerment used the study will use the economic empowerment index,political empowerment index, personal empowerment index and family empowerment index as a dimensions of women's empowerment. As Economic empowerment dimension is similar with the Decision making power of Malhotra *et al.* (2002), Household empowerment dimension is also related with the works of Agency of Kabeer and Access to Resources of malhotra, Personal and Political Empowerment dimension is also similar with Achievement dimension of Kabeer (1999). According to Kabeer (1999), the ability to make strategic choices has three dimensions: resources,

agency and achievements. Resources can be seen as the pre-conditions for making choices. They include access to and control over physical assets, but also access to social assets such as education and social networks. Agency is the process dimension of empowerment. It is the "ability to define one's goals and to act upon them". The agency dimension has often been measured as decision-making ability of women, for example decisions on purchases, children's education and health, working outside the home, family planning and marriage of children. The third empowerment dimension, achievements, may be measured as a reduction in violence against women, increased freedom to move.

Measuring Empowerment of Women Flower Vendors through Dimension Index

Women's empowerment is multidimensional and it is very difficult to measure. It comprises the entire complex of interactions, roles, rights and statuses that surround being male versus being female in a given society or culture (Mason, 1997). However, in our study we have tried to measure women's empowerment index and autonomy index related to flower vending business by making women empowerment index using the dimensions in accordance with Mason and Smith (2003). The particular aspects or dimensions of empowerment we take are: (a) women's economic decision-making power (Economic Empowerment), (b) their household decision-making power (Household Empowerment), (c) their physical freedom of movement (Social Empowerment) The detailed description of these three dimensions with their relevant indicators is given in table 1. The index of each dimension (economic decision making, household decision making, and physical movement) is constructed following HDI made by the United Nations Development Program (UNDP 2005) using the formula below:

$$\text{Dimension Index} = [(\text{Actual score} - \text{Minimum score}) / (\text{Maximum score} - \text{Minimum score})]$$

The actual score of each dimension is calculated by summing the positive responses of the respondents in favour of their empowerment or autonomy. Maximum score of each dimension is the total number of indicators belonging to that dimension and minimum score is zero with all negative response. The value of those indices ranges from zero to one and one minus the indices value measures the gap of empowerment or autonomy.

Now, the Women Empowerment Index (WEI) is then computed in a simple average of these three indices according to the formula below:

$$\text{WEI} = 1/3(\text{economic decision making index}) + 1/3\ (\text{Household decision making index}) + 1/3\ (\text{Freedom of Physical Movement index})$$

Table 1: Description of indicators and dimensions for constructing women empowerment and autonomy indices

Dimension	Description of Indicator	Coding	Measurement Scale for Empowerment
Economic Decision-Making	Who decides how to spend money	1=Respondent alone 2=Respondent and husband 3= Husband alone 4=Someone else(in-laws) in house	1,2 = 1 3,4 = 0
	Final say on large household purchases	1=Respondent alone 2=Respondent and husband 3= Husband alone 4=Someone else(in-laws) in house	1,2 = 1 3,4 = 0
	Final say on making household purchases for daily needs	1=Respondent alone 2=Respondent and husband 3=Respondent and other person 4=Husband alone	1,2,3 = 1 4 = 0
	Final say on own health care	1=Respondent alone 2=Respondent and husband 3=Respondent and other person 4=Someone else	1,2,3 = 1 4 = 0
Household Decision Making	Final say on child health care	1=Respondent alone 2=Respondent and husband 3= Husband alone 4=Someone else(in-laws) in house	1,2 = 1 3,4 = 0
	Final say on food to be cooked each day	1=Mainly Respondent 2=Respondent and husband 3=Respondent and other person 4=Someone else	1,2,3 = 1 4 = 0
	Decision on family Planning	1=Mainly respondent 2=Joint decision 3=Mainly husband 4=Others	1,2 = 1 3,4 = 0
Physical Movement	Final say on visits to family or relatives	1=Respondent alone 2=Respondent and Husband 3=Husband alone 4=Someone else	1,2 = 1 3,4 = 0
	Goes outside the village/town/city alone	1=Alone 2=with husband 3=With children 4=Others family members	1 = 1 2,3,4 = 0
	Goes to a health centre or hospital alone	1=Alone 2=with husband 3=With children 4=Others family members	1 = 1 2,3,4 = 0
	Goes shopping alone or with somebody else	1=Alone 2=With children 3=With husband 4=With relatives	1 = 1 2,3,4 = 0

As per the United Nations Development programme (UNDP, HDI, 2005) of framing Human development indices, the value of index 0 is deprived of development and value 1 is showing the full development, value between 0 to 0.5 having minimum level of development, 0.5 to 0.7 is medium level of development and 0.8 and more have high development.

Once the Women Empowerment Index is being constructed then we can also easily find out the major factors affecting the empowerment of women flower vendor through Ordinary Least Square (OLS) regression technique. In this case, the independent variables may be written as:

1. Income of the respondent [Y] (Quantitative variables)
2. Savings of the respondent [S] (Quantitative terms)
3. Education level of the respondent [Edu] (Binary choice variable, 1 for 'Literate' and 0 for 'Illiterate')
4. Political participation [PP] (Binary choice variable, 1 for 'yes' and 0 for 'No')
5. Access to health [AH] (Binary choice variable, 1 for 'yes' and 0 for 'No')
6. Working hour per day [WH] (Quantitative variables)
7. Land acquisition [LA] (Binary choice variable, 1 for 'yes' and 0 for 'No')

In this regard, the OLS regression model can be written as:

$$WEI = \sim_0 + \sim_1 Y + \sim_2 S + \sim_3 Edu + \sim_4 PP + \sim_5 AH + \sim_6 WH + \sim_7 LA + u$$

Where, *'u'* is the random error term of the model with basic properties of the error term in classical linear regression model. To estimate this model we use SPSS software version 18.

4. Results and Discussion

Decision making has been a central concern of much prior research on women empowerment. It is commonly believed that economic empowerment and stringent legal instruments have important role to play in combating social inequalities and disparities. Economic solvency is vital to ensure basic necessities and opportunities for every citizen including men and women. It is hypothesized that a greater involvement in household decision making will place women in a better position to exert influence over health, control over household resources etc. and women's freedom of physical movement outside the home may have important implications for exposure to information, development of interpersonal skills, increased self-confidence, and opportunities to take independent action.

Table-2 presents the result of empowerment of women related to flower vending business in Kolaghat flower market by mean values of economic decision-making index (EDMI), household decision-making index (HDMI), and physical movement index (PMI).

Table 2: Mean Values of empowerment indices related to women flower vendor

Mean of EDMI	Mean of HDMI	Mean of PMI	Mean of WEI
0.97	0.80	0.67	0.81

Source: Authors own calculation.

The average values of three indices, namely, economic decision making, Household decision-making opportunity and physical movement satisfy the expectation. The WEI is the metric of women power practice in Kolaghat flower market and was constructed based on three dimensions. The WEI satisfies the minimum expectation.

From the above table, we also find that the empowerment level in economic decision making of the women flower vendor is comparatively higher than the household decision making and the freedom of physical. These results indicate that though the dimension index shows overall empowerment of women but there is a disparity between the dimensions. Though Flower vending enables women of the Kolaghat flower market to be empowered economically but there is some sort of lacuna in empowerment in rest of the two dimensions mentioned above. This may be arises from the social prejudices in rural or semi-rural suburbs.

It will be quite interesting to see the status of empowerment through a frequency table. Which will assess the disparity in empowerment between women's related to flower vending business in Kolaghat flower market. In Table-3, we present the respondent frequency with their level of empowerment.

Table-3: Respondent frequency with their level of empowerment

Empowerment level	Scores	Frequency
Minimum Level of Empowerment	0.00 to 0.50	0
Medium Level of Empowerment	0.60 to 0.70	12
High Level of Empowerment	0.80 to 1.00	18
Total		**30**

Source: Authors' own calculation.

From the above table, we can clearly see that the flower vending business leads to a moderate level of empowerment to the overall and a high level of empowerment for a large section of women flower vendors. This significantly implies that the after joining the flower vending business the women's related flower vending business are being empowered.

Now to find the major determinants of empowerment of women flower vendor of the Kolaghat flower market, we have to check the following regression result.

$$WEI = 0.315 + 4.405\,Y + 0.001\,S + 0.044\,Edu + 0.009\,PP + 0.20\,AH + 0.04\,WH + 0.027\,LA$$
$$(2.563^*)\quad (5.054^*)\quad (0.139)\quad (2.901^*)\quad (0.409)\quad (2.046^*)\quad (3.811^*)\quad (1.751^{**})$$

Where, $R^2 = 0.723$, $\bar{R}_2 = 0.635$ and $F = 8.196^*$. t-values are given in the parenthesis.

From the model summary, we find the overall significance of the model is significant and the above model explains 72.3% (from the R^2). Thus, the model is good fitted one. Now, from the regression results, we can say that the level of income is one of the key determinants of empowerment for the women flower vendor. As the level of income has positive and highly significant impact on the women empowerment. Women flower vendors saving also act positively in their empowerment process. This is may be due to the fact that women feel more psychologically dependent on their worth. Though in our study, this variable is insignificant. Education on the other hand also plays a major and positive role in the development process related to flower vendor. This result is similar with the studies made by Jamal *et al.* (2007), Kabeer (1999), Kishore *et al.* (2000, 2004) etc. Access to health, working hour and land acquisition have its positive and significant impact on the empowerment level of the women flower vendors. Political participation though not significantly impacted on the empowerment level of the women flower vendors in the Kolaghat flower market.

5. Conclusion

Women power practice related to flower vending is optimally high in Kolaghat flower market. The lives of women have been changing. Their high self-worth to decision is a sign of growing consciousness. Over time, women have been increasingly involved in decision making. Their mobility is unconvincing, but is close to our expectation. We hope that the mobility of women will increase along with the improvements in facilities, such as reserved seats for women in public transport and law enforcement to stop sexual harassment against women. Access to resources is the key to power but women are not allowed to perform well, as indicated by a value lower than expected. Women can regulate and control their own life according to the expectation of the study, but sustained support from society is necessary for continued performance. Women do well in regulating and controlling their lives as the overall performance is at the highest satisfactory level.

Thus we can conclude that the women related to flower vending business in Kolaghat flower market achieve and increases their level of empowerment through this job. The main factors affecting their level of empowerment are their respective income, their educational status, access to health and lastly the working hour in the flower market.

Using the results of this study, we recommend certain steps to improve the power practice of women. Women have perceptions about their rights and abilities. Sustained support from the state and society is necessary to motivate theirperceptions. The

education of women should not be compromised, and the ongoing support for women's education should be intensified. Involvement in income-generating activities should be expanded because of its supportive role in women power practice and because it has a similar trend with the WEI and a significant effect at the 1% level. Support to women should be provided in the form of income-related activities to make them active stakeholders of the economy. A good working environment, as well as reliable traffic and security systems, should be provided to encourage the mobility of women related to the flower vending business. The deep-rooted importance of women at the family level is essential to improve their access to resources. The right of women to inherit property, which can fortify the role of women in the family, should be respected.

Thus, objective law enforcement must be strengthened. Policy steps that have already been taken, including the provision of transport facilities for women, public and private partnerships in women's entrepreneurial arrangement as well as rules against sexual harassment, deserve appreciation because they support the goal of female empowerment in India. Thus, this study recommends keeping these policies operational and introducing other effective strategies to promote the abilities and protect the rights of women.

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11

Conservation Agriculture - A Viable Option for Diversification, Mitigation of Climate Change and Rural Livelihood Security in Eastern India

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Abstract

Attaining food and nutritional security for growing population while sustaining the agricultural systems under present scenario of depleting natural resources, negative impacts of climate variability are the major challenges in India. Conservation agriculture is a system designed to achieve agricultural sustainability by improving the biological functions of the agro-ecosystem with limited mechanical soil disturbances, continuous soil organic cover and diversification through crop rotation. It is a paradigm shift from conventional system of agriculture. Conservation agriculture is an alternative to the conventional production system for improving productivity and sustainability. About 125 M ha area is practiced following the concepts and technologies for conservation agriculture in the world. In Asia, it accounts about 2.5% of global conservation agriculture acreage. Suitable machineries have been developed for successful cultivation under conservation agriculture in India. It provides host of benefits including enhanced farm productivity and profitability, maintenance of soil health, addressing the issues like labour crisis, climate change and variability thereby improving livelihood security of rural people in eastern India.

Keywords: *Climate change, conservation agriculture, crop diversification, crop rotation, cropping system, zero tillage*

Introduction

India is bestowed with the best kind of natural resources of land, water, climate and biodiversity which are sufficient to meet the food and nutritional need of people. However, these resources have been overexploited during the last four and half decades

to meet food, feed, fibre and fuel demands of human and animal beings. It is heartening to know that India supports about 17% human and 11% of livestock population of the world just on 2.8% land and 4.2% of water resources (Singh, 2012). The rapid mechanization, especially in the form of tractor, power tiller and combine harvester, coupled with science-driven innovations led to efficiencies enabling outputs of high quality produce per unit area and time. The transformation of 'traditional animal-based subsistence farming' to 'intensive chemical and tractor - based conventional agriculture' has led to multiplicity of issues associated with sustainability of these production practices. Post-Green Revolution input intensive conventional agriculture systems have led to several concerns, such as declining factor productivity, declining ground water table, development of soil salinity, deterioration in soil fertility and soil physical environment, biotic interferences and declining biodiversity, air and ground water pollution and stagnating farm incomes. Attaining food and nutritional security for growing population while sustaining the agricultural systems under present scenario of depleting natural resources, negative impacts of climate variability and volatile food prices are the major challenges in India. In addition to these, soil erosion and decline of soil organic matter mainly caused by intensive tillage, degradation of soil structure, reduced water filtration rates and soil compaction, minimum or no return of organic materials to soil and mono cropping are the major indicators of the unsustainable agricultural systems. The current state of production systems is posing a threat to food security and livelihood of farmers, especially to poor and under-privileged smallholders in vulnerable ecologies. Hence, the agronomic management in conventional crop production systems need to be looked into critically with an overall strategy of producing more food with reduced risks and costs, increasing input use-efficiency, *viz*. land, labour, water, nutrients, and pesticides, improving and sustaining quality of natural resource base and mitigating emissions and greater resilience to changing climates (Sharma *et al.*, 2013).

Producing sufficient food for the increasing population in a backdrop of decreasing resources and domain of changing climate is really a challenging task. Widespread resource degradation problems under conventional system, and the need of reducing production costs, increasing profitability and making agriculture more competitive, have made the conservation issues more imperative. A paradigm shift in farming practices is crucial for future sustainable productivity. Conservation agriculture (CA) is a viable option for sustainable agriculture with an effective solution to climate change adaptation and mitigation, improved farm productivity and profitability and thereby livelihood security in rural India. The CA, which is advocated as an alternative to the conventional production system is now adopted by many countries and agencies as a lead model for sustainable agricultural intensification.

In this paper an attempt has been made to summarize the concept of CA, it's prospects, components, CA under different cropping systems in eastern India, CA vs. climate change in Indian perspectives.

Conservation Agriculture - A New Archetype in Crop Production

CA practices provide a paradigm shift in soil and crop management with aim of establishing sustained soil health that can offer the best crop and livestock productivity within the prevailing ecological and socio-economic conditions.

Table 1. Conventional agriculture vis-à-vis conservation agriculture

Conventional agriculture	Conservational agriculture
1. Cultivating land, using science and technology with greater interference in natural process	1. Minimum interference with natural process
2. Extensive mechanical tillage and chance of soil erosion	2. No-till or drastically reduced tillage (biological tillage) and minimum soil disturbances
3. High wind and soil erosion	3. Low wind and soil erosion
4. Water infiltration is low	4. Infiltration rate of water is high
5. Residue burning or removal (bare soil surface)	5. Surface retention of residues (permanently covered soil surface)
6. Use of ex-situ FYM/composts and other organic matters	6. Use of in-situ organics/composts
7. Practice of green manuring by incorporation	7. Brown manuring/cover crops
8. Kills established weeds but also stimulates more recruitment of weed seeds from deeper layer of soil to germinate	8. Weeds are a problem in the early stages of adoption but decrease with time
9. Free-wheeling of farm machinery, increased soil compaction	9. Controlled traffic, compaction in tramline, no compaction in cropped area
10. Mono-cropping/culture, less efficient rotations	10. Diversified and more efficient rotations
11. Greater reliance on manual labour, uncertainty of operations	11. Mechanized operations, ensure timeliness of operations
12. Poor adaptation to stresses, yield losses more under stress conditions	12. More resilience to stresses, yield losses are less under stress conditions
13. Productivity gains in long-run are in declining order	13. Productivity gains in long-run are in incremental order

Modified from Hobbs *et al*., 2007 and Sharma *et al.*, 2013)

Adequate food production for ever-increasing population can only be achieved through the implementation of sustainable growing practices that minimize environmental degradation and preserve resources while maintaining high-yielding profitable systems. Conservation agriculture is a system designed to achieve agricultural sustainability by

improving the biological functions of the agro-ecosystem with limited mechanical practices and judicious use of chemical inputs (FAO, 2010). It is characterized by three linked principles, *viz*.

(i) **Minimum mechanical soil disturbance**- which facilitates minimum to moderate organic matter oxidation, improves porosity to water movement and retention, limits recruitment of weed seeds from buried deeper layers and their germination.

(ii) **Permanent organic soil cover**- acts as buffer against direct impact of solar radiation and rainfall, a substrate for biological activities in the soil, smothering of weeds etc.

(iii) **Diversification of crop species** including legumes grown in sequences and/ or associations- advantages of crop rotations like less infestation of crop associated diseases and insect pests through life cycle disruption, biological nitrogen fixation reducing external cost, slow release of nutrients, improvement of soil health by organic matter addition.

A host of benefits can be achieved through employing components of conservation agriculture or conservation tillage, including reduced soil erosion and water runoff, increased productivity through improved soil quality, increased water availability and biotic diversity, and reduced labour demands. Conservation agriculture systems require a total paradigm shift from conventional agriculture with regard to management of crops, soil, water, nutrients, weeds, and farm machinery.

Current Status of Conservation Agriculture

Conservation farming was first investigated in the 1940's in Nebraska, USA where mulch was used to control wind erosion. Conservation agriculture systems are being advocated since 1970's but it is only in the last 2 decades that the area has been increasing rapidly. This has been accelerated due to development of efficient farm machinery and availability of effective herbicides for weed management, which have resulted in reduced production costs and higher profitability, besides several indirect benefits. CA, a concept evolved as response to concerns of sustainability of agriculture globally and steadily increased worldwide to cover about 8.6% of the world arable land. Presently, about 125 M ha area is practiced following the concepts and technologies for conservation agriculture; the major countries being USA, Brazil, Argentina, Canada and Australia. In Asia, the CA accounts about 2.5% of global CA acreage and covers merely 0.54% of the arable land of Asia. Whereas, in Austarlia and South America the area under CA is 69 and 58% of arable land area respectively (Friedrich *et al.*, 2011). Resource conservation technologies are practiced in more than 3 M ha under the rice-wheat based system in the Indo-Gangetic plains of South Asia (Sharma *et al*., 2013**)**. The major CA-based technology being adopted in this region is zero-till (ZT) wheat in the rice-wheat system. West Asian countries like Iraq and Syria has adopted CA in about 6,000 and 15,000 ha respectively by 2010-11 from almost nil in 2006-07 (Piggin

et al., 2011). With the resolute efforts of Conservation Agriculture Network for South-East Asia (CANSEA) in collaboration with other organizations the acreage under CA has increased steadily in the region consisting of Cambodia, China, Indonesia, Thailand, Vietnam etc. More than one million hectares spring wheat is annually planted under CA based management in Central Asia. Kazakhstan is already among top 10 countries with the largest area under no-tillage in the world.

Components of Conservation Agriculture

The three components of conservation agriculture include:

1. Direct planting of crop seeds
2. Permanent soil cover, especially by crop residues and cover crops
3. Crop diversity

1. Direct seeding or planting:

Direct seeding involves growing crops without mechanical seedbed preparation and with minimal soil disturbance since the harvest of the previous crop. The term direct seeding is used in CA systems as synonymous with no-till farming, zero tillage, no-tillage, direct drilling, etc. Planting refers to the precise placing of large seeds like maize and beans; whereas seeding usually refers to a continuous flow of seed as in the case of small cereals like wheat and barley. The equipment penetrates the soil cover, opens a seeding slot and places the seed into that slot. The size of the seed slot and the associated movement of soil are to be kept at the absolute minimum possible. Land preparation for seeding or planting under no-tillage involves slashing or rolling the weeds, previous crop residues or cover crops; or spraying herbicides for weed control, and seeding directly through the mulch. Crop residues are retained either completely or to a suitable amount to guarantee the complete soil cover, and fertilizer and amendments are either broadcasted on the soil surface or applied during seeding.

2. Permanent soil cover:

Retaining and management of adequate amount of crop residues (at least 30%) under conservation agriculture is the key to realize long-term benefits and also to reverse the process of soil degradation. A permanent soil cover is important to protect the soil against the deleterious effects of exposure to rain and sun; to provide the micro and macro organisms in the soil with a constant supply of food and suitable microclimate in the soil for optimal growth and development of soil organisms, including plant roots. Cover crops need to be managed before planting the main crop. The most important aspect is that the soil is always kept covered. In a soil that is not tilled for many years, the crop residues remain on the soil surface and produce a layer of mulch. Retention of crop residues improves organic carbon content, water stable aggregates, bulk density, hydraulic conductivity and reduces runoff.

A host of benefits obtained from soil cover are as under:

(i) Improved infiltration and retention of soil moisture resulting in less crop water stress and increased availability of plant nutrients.
(ii) Greater provision of food and habitat for diverse soil life: creation of channels for air and water, biological tillage and substrate for biological activity through the recycling of organic matter and plant nutrients.
(iii) Increased humus formation.
(iv) Reduction in runoff and soil erosion, crusting and surface sealing by the action of rain drops on soil surface.
(v) Chance of soil regeneration is higher than soil degradation.
(vi) Mitigation of temperature variations on and in the soil.
(vii) Favourable environment for the development of roots and seedling growth.

3. Crop Rotation

Crop rotation is the repetitive cultivation of an ordered succession of crops and/or crops and fallow in a piece of land. It provides several benefits including restoration of soil fertility, improvement of microbial activities and physico-chemical properties of soil. Crop rotation also facilitates rotation of all the component technologies of different crops thus avoids repetition of the similar activities on and in the soil. The rotation of crops is not only necessary to offer a diverse kind of food materials to the soil microorganisms, but they are capable of exploring different soil layers for nutrients. Nutrients that have been leached to deeper layers and no longer available for the shallow rooted crops can be recycled by the deep rooted crops in rotation. This way the crops in rotation function as biological pumps. Furthermore, a diversity of crops in rotation leads to a diverse soil flora and fauna, as the roots excrete different organic substances that attract different types of bacteria and fungi, which in turn, play an important role in the transformation of these substances into plant available nutrients. Crop rotation also has an important phytosanitary function as it prevents the carryover of crop-specific, crop-bound and crop-associated insect pests, diseases and weeds from one crop to the next. Other general benefits of crop rotation are:

(i) Diversity in plant production meets the need of food, feed, fibre, fuel etc. for human and livestock.
(ii) Reduced risk of insect pest and weed infestations.
(iii) Reduction of soil compaction and increased soil aeration due to distribution of channels or biopores created by diverse roots of various forms, sizes and depths.
(iv) Better movement of soil water and distribution of nutrients through the soil profile.
(v) Greater use and availability of plant nutrients and water from diverse layers of the soil profile by roots of different plant species grown in rotation.

(vi) Increased nitrogen fixation mainly by inclusion of legumes in rotation and improved balance of N/P/K from both organic and mineral sources.

(vii) Better price of produce and higher farm profitability.

Machinery for Conservation Agriculture

Use of machine can address the issue like huge labour crisis and facilitates timeliness of farm operations. One major need of CA is the development and availability of equipment that will allow sowing, good germination and establishment of crops while, at the same time, minimizing soil disturbance and sowing the seed and fertilizer into loose and anchored stubbles. Equipment should be available at an affordable price, with provisions for after-sales service and supply of needed spare parts to make this system successful. Recently, Multi-crop zero-till planter, Multi-crop zero till ferti-seed drills fitted with inverted T openers, Disc planters, Punch planters, Trash movers or Roto-disc openers have been developed for seeding into loose residues. The Happy seeder and Turbo Happy seeder have been developed in India to facilitate direct drilling of crops in standing stubbles and loose straw and retaining it as surface mulch in single operation. Many advantages have been mentioned and characterized for this innovation including savings in fuel costs and the benefits of less greenhouse gas emissions, less weeds, more beneficial insect activity, improved water use efficiency, higher yields at less cost thereby improved farm and family income.

CA under different Cropping Systems in Eastern India

The rice-wheat cropping system is popularly known as Indian food security system. This cropping system in the eastern Indo-Gangetic Plains has a combined average grain yield of 3.8 t/ha (Anonymous, 2009) against 11 t/ha in Haryana (Coventry *et al*. 2011), a state of Western Gangetic Plain. Lower system productivity in this cropping system in eastern parts has many reasons at the same time there is enough opportunity to increase it. In the background of growing concerns of sustainability and degradation of natural resources many researchers and planners are in the opinion that future bread basket of South Asia will shift towards east where water resources are abundantly available. The conventional rice based system is labour intensive, less mechanized, uses low inputs and faces serious problem of excessive water during the monsoon in eastern Gangetic plain. No tillage *utera* (surface seeding)/zero tillage/reduced tillage system has shown promise in terms of higher productivity, larger reduction in cost of cultivation ensuring timely sowing thereby utilizing short and mild winters in eastern India over conventional system (Duary and Pradhan, 2000; Duary and Ghosh, 2013 and Duary *et al*., 2013). It has been realized that benefits of CA can be further improved by adopting remunerative cropping system/catch crop. In addition to rice and wheat other crops such as maize, mustard, mungbean, linseed, lentil, sesame, black gram, pigeon pea, potato and sugarcane should be taken into consideration under CA.

Major rice based cropping systems in eastern Indo-Gangetic plains where CA can be practiced are:

- Rice-wheat- greengram/blackgram
- Rice-Jute/Rice
- Rice-wheat/Boro rice- green manuring crop
- Rice- chickpea-sesame
- Rice-yellow sarson-greengram/blackgram
- Rice-toria-Boro rice
- Maize-yelow sarson- greengram

Current fallow and rice fallow lands constitute a major portion of under utilized lands in the eastern Gangetic plain. Major causal factors for lands remaining fallow include erratic nature of monsoon, lack of irrigation facilities and vacating of the rice fields too late to permit planting of second crop during the winter season. Rice fallow lands generally belong to poor farmers having no irrigation facilities and they mainly depend on monsoon rains for crop production. The timely seeding that taps the residual moisture of the previous rice crop, relay cropping or surface seeding of legumes (lathyrus, lentil, chickpea, field pea) and oilseeds (linseed, yellow sarson, safflower) could offer potentially good cost effective options for resource poor farmers in areas that lack irrigation facilities. Late planting of rice is a common feature in eastern Gangetic plains due to uncertainty of rainwater/ground water irrigation facilities/submergence problems. Photosensitive varieties of rice are preferred in rainfed lowland (submergence/ water logged situation) which matures in November end or even December first week. In mid land situations due to poor groundwater irrigation facilities, transplanting are always delayed. All these situations compel for delayed sowing of *rabi* crops. A sizeable area in the eastern Indo Gangetic Plains is mono-cropped under medium and long duration varieties of rice. The unavailability of irrigation water and delay in vacating the field after rice do not normally permit the sowing of second crop because the top layer of soil dries up at the time of rice harvesting and therefore, planting of a winter crop is not feasible. Under such conditions combinations of tillage practices like conventional tillage (CT) in rice- zero tillage (ZT) in lentil, CT rice-ZT toria, CT/ZT rice-ZT yellow sarson, CT rice-ZT lathyrus and CT rice-ZT linseed could convert these monocropped areas into double cropped areas and hence increase and sustain productivity of the rice based systems in eastern India.

Climate change and Conservation Agriculture

Climate change and its variability are emerging as the major challenges likely to impact the sustainability of the Indian Agricultural Production system. High inter and intra-seasonal variability in rainfall distribution, extreme temperature and rainfall events are resulting in crop damages and losses to the farmers. Conservation agriculture is not only important for food security but also for reduction of fossil fuel emissions. Climate change is likely to strongly affect rice–wheat, rice–rice and maize-based cropping

systems which cover major areas of agricultural lands in South Asia. Agronomic and crop management practices have to aim at reducing CO_2 and other greenhouse gas emissions by reducing tillage and residue burning and improving nitrogen use efficiency. In the Indo-Gangetic Plains, CA continue to expand in the rice–wheat cropping systems and save 50–60 litre of diesel ha^{-1} plus labour and significantly reduce release of CO_2 to the environment. Agricultural green house gas (GHG) emissions can be curbed by decreasing fuel use by field equipment. Each gallon of diesel fuel burned by a tractor is estimated to release 10,180 grams of CO_2 (EPA, 2011). Methane emissions that have a warming potential 21 times that of CO_2 are common and significant in puddled anaerobic paddy fields and also when residues are burnt. This Greenhouse gas emission can be mitigated by shifting to a No-till rice system.

Resource conservation technologies (RCTs), developed recently reduce green house gas (GHG) emission compared to conventional practices. The RCTs like zero tillage (ZT) and no tillage *utera* (surface seeding) allow the farmers of eastern India to sow the *rabi* crops like wheat, rapeseed-mustard etc. earlier in rice based system so as to utilize short mild winter and thereby facilitating maturity of the *rabi* crops before onset of high temperature. Zero tillage or no tillage *utera* combined with residue retention on soil surface facilitates higher C sequestration in the upper most layer over conventional tillage (CT). Zero tillage also has a high global warming potential (GWP) reduction strength of 83.9% (Pathak and Chakrabarti, 2012). If this reduction in GWP could be traded as C credit, then farmers could get some additional income by the adoption of these technologies. Policies and incentives would have to be developed to encourage farmers for adopting this.

Conclusion

Conservation agriculture basically depends on three principles of minimum soil disturbances, permanent soil cover and diversification through crop rotation. It is a paradigm shift from conventional system of agriculture. In the backdrop of degradation of natural resources, threat of sustainability, climate change and variability it provides host of benefits including sustained productivity, maintenance of soil health, reduction of cost of cultivation. That's why the area under CA is rapidly increasing over the globe including Asian countries. With suitable machinery, hands on training and extension on zero or reduced tillage and residue management, the CA may be the future solution in addressing many issues related to sustainability. Thus conservation agriculture is a viable option for sustainable agriculture with an effective solution to climate change adaptation and mitigation, improved farm productivity and profitability and thereby livelihood security in rural India.

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12

Spatial Variation and Disparity of Literacy in West Bengal

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Abstract

Universal primary education is one of the eight Millennium Development Goals (MDG's) which is to be attained by 2015. Education is one of the key indicators of Human Development Index and Gender Development Index. According to West Bengal Human development Report, 2004, Human Development Index (HDI) of West Bengal is 0.61, Gender Development Index (GDI) is 0.549 and Education Index is 0.69. We are reminded of Mahatma Gandhi's famous saying that "Educate one man, you educate one person, but educate a woman and you educate a whole civilization." Women are thus equally needed to be educated and only then the gap between all other socio-economic variables can be reduced. Thus it is essential to understand the spatial variation and disparity of literacy and the present paper tries to highlight the spatial pattern and variation of literacy in the state of West Bengal and it also tries to compare the state of literacy with India's average.

Keywords: *Spatial pattern, literacy rate, literates, gender disparity.*

Introduction

Universal primary education is one of the eight Millennium Development Goals (MDG's) which is to be attained by 2015. To meet the challenges of modern society, the increasing complexity and technological innovations, one has to be equipped with the basic education. In the primitive days very few people had formal education and thus there was no question of disparity. But the recent trend shows that the disparity is increasing in every sphere. Education is one of the key indicators of Human Development Index and Gender Development Index. According to West Bengal Human development Report, 2004, Human Development Index (HDI) of West Bengal is 0.61, Gender Development Index (GDI) is 0.549 and Education Index is 0.69. The Education Development index published by NUEPA has placed the state as one of the low ranking

states in India and it has barely managed its 32nd rank out of 35 Indian states and Union Territories. These facts lead to the conclusion that the state requires a special intervention to bring it in line with other better performing states in the country (Basak and Mukherji, 2012). Education is not only related to attainment of formal education but is the tool which develops capability to handle complex situations. According to Swami Vivekananda, "Education is the manifestation of perfection already in man." We are also reminded of Mahatma Gandhi's famous quotation that Educate one man, you educate one person, but educate a woman and you educate a whole civilization. Women are thus equally needed to be educated and only then the gap between all other socio-economic variables can be reduced. Thus it is essential to understand the spatial variation and disparity of literacy and the present paper tries to highlight the spatial pattern and variation of literacy in the state of West Bengal.

Concepts and Definitions

According to Census 2011, a person aged seven and above who can both read and write with understanding in any language is treated as literate. A person who can only read but cannot write is not literate. It was decided in the 1991 Census that all children in the age group of 0-6 years would be treated as illiterate by definition and the population aged 7 years and above only would be classified as literate or illiterate. The same criterion has been retained in the Censuses of 2001 and 2011. It is also not necessary that to be treated as literate, a person should have received any formal education or acquired any minimum educational standard. Crude Literacy rate (CLR) is calculated by taking the total population in the denominator. Since literacy rate is more meaningful if the sub population in the age group 0-6 years is excluded from the total population, it was decided in 1991 Census to calculate the literacy rate for the population of 7 years and above .Literacy rate calculated taking into account the 7 and above population in the denominator is called the Effective Literacy Rate (ELR).

In the present paper crude literacy rate and effective literacy rate has been used interchangeably.

Study Area

The present study relates to the state of West Bengal which covers an area of 88752 sq kms which is about 2.7% of India's total geographical area. It is located between 21^{o}25'N to 26^{o}50'N latitude to 86^{o}30'E to 89^{o}58' E longitude. It extends from the Himalayas in the north to the Bay of Bengal in the south and Orissa, Jharkhand, Bihar and Nepal surrounding the west. According to 2011 Census, India has a population density of 382 persons per sq kms and West Bengal ranks 7th with 1029 persons per sq kms among the Indian states and territories. The total literacy rate of India is 73% and West Bengal ranks 20th among all the states and union territories with a literacy rate of 76.3%.

Objectives

The objectives of the present study are:

- To compare the pattern and disparity of literacy between India and West Bengal.
- To analyze the pattern of district-wise literacy of West Bengal.
- To measure and compare the disparity in literacy temporally.
- To measure inter-district literacy disparity of West Bengal.

Methodology

The present study is mainly based on secondary data collected from Censuses of India. An attempt has been made to tabulate, process and analyze the data's by using suitable statistical techniques. Crude literacy rate (CLR) and Effective Literacy rate (ELR) has been calculated by using the following formulas:

$$CLR = \frac{\text{Number of literate persons} \times 100}{\text{Total population}}$$

$$ELR = \frac{\text{Number of literate persons aged 7 and above} \times 100}{\text{Population aged 7 and above}}$$

For measuring the gender disparity and rural-urban disparity index in literacy, Sopher's Disparity Index (1974) modified by Kundu and Rao (1983) has been used.

$$D_s = \text{Log}\,(X_2/X_1) + \text{Log}\,(100\text{-}X_1) / (100\text{-}X_2)$$

Where $X_2 > \text{or} = X_1$

Kundu and Rao modified the formula as:

$$D_s = \text{Log}\,(X_2/X_1) + \text{Log}\,(200\text{-}X_1) / (200\text{-}X_2)$$

To measure the inter-district disparities Coefficient of Variation is calculated by using the following formula:

Coefficient of Variation (C.V) = Standard Deviation/Mean

Discussion

Comparison of literacy between India and West Bengal

Crude literacy rate was found out to compare the literacy rates of India and West Bengal over a span of thirty years (1981 to 2011). In 1981 the literacy rate of India was 40.9% when West Bengal was 36.23%. From the graph it is clear that the literacy rates for both India and West Bengal had a sharp increase from 1991 onwards. Through-out this span of thirty years the literacy rate of West Bengal was always higher than India's average.

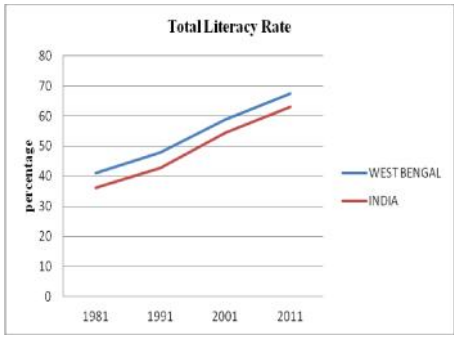
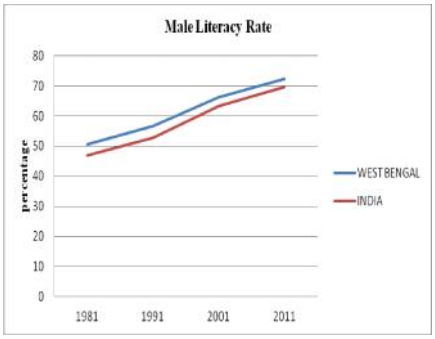


Figure: 1



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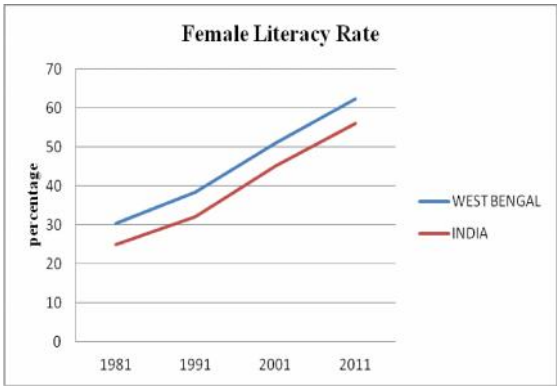
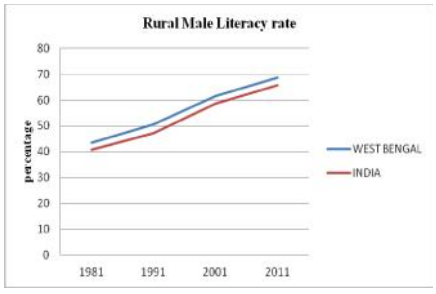


Figure: 3

From figure 2 and 3, it can be interpreted that the gap between female literacy rate was greater than male literacy rate between India and West Bengal. Crude Literacy rate has been used because 1981 census did not identified the 0-6 years of population. The female literacy rate of West Bengal has increased from 30.3% (1981) to 62.3% (2011).

Rural male and female literacy rates too have showed a steady increase for both India and West Bengal. In 1981 the rural female literacy rates were miserable and it can be seen that from 1991 onward it has increased sharply.



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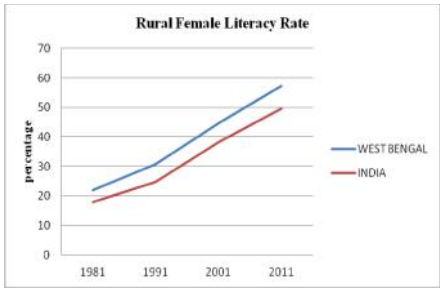

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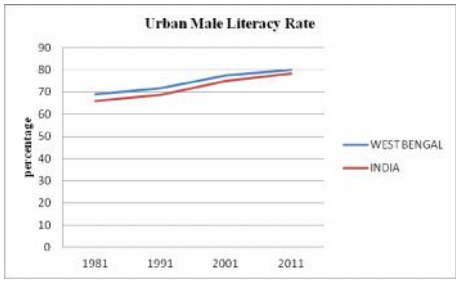

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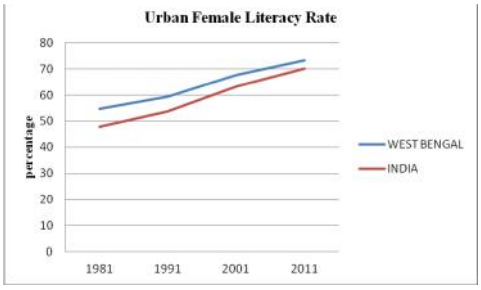


Figure: 7

Urban male literacy rate was high in1981 and the change is thus not very significant till 2011. Urban female literacy rate has increased steadily.

Effective literacy rate has been used to find the gender and spatial disparity of India and West Bengal, 2011. Disparity Index has been calculated using Sopher's method which was later modified by Kundu and Rao.

Table: 1

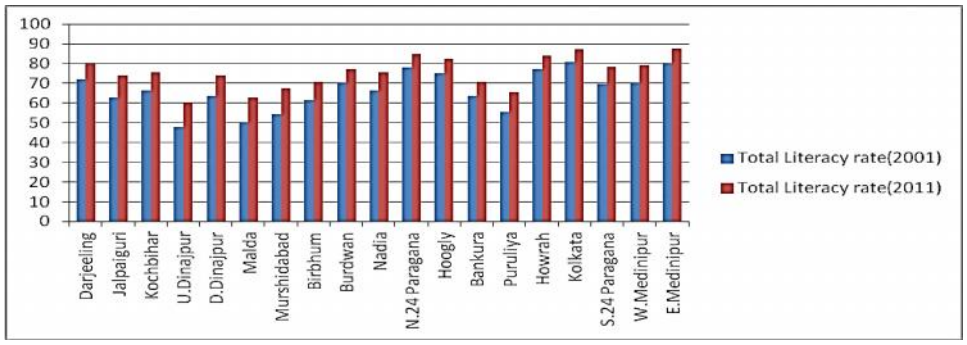
Indicators	**India**	**West Bengal**
Disparity Index (Male/Female)	0.153	0.106
Disparity Index Rural (Male/Female)	0.1884	0.126
Disparity Index Urban (Male/Female)	0.0866	0.066
Disparity Index (Rural/Urban)	0.151	0.115

From table-1 it can be observed that Gender disparity is lower in West Bengal than in India. Both in the rural and urban areas gender disparity is lower in West Bengal that in India. Rural-Urban disparity is also lower in West Bengal than in India. By comparing the Disparity Index of West Bengal of 2001 and 2011, it can be concluded that total gender disparity index has decreased from 0.169 (2001) to 0.106 (2011). Rural gender disparity index shows a sharp decline from 0.202 (2001) to 0.126 (2011).

District wise literacy of West Bengal

Effective literacy rates have been used. Total, rural and urban literacy rates have all increased from 2001 to 2011 for all the districts of West Bengal.

In 2001, Uttar Dinajpur and Malda had the lowest literacy rate. They remain to be the lowest in 2011 but by studying the rate of progress it can be observed that highest increase in literacy rate has taken place in Uttar Dinajpur, Malda, Murshidabad Dakshin Dinajpur and Jalpaiguri. Thus the northern districts have shown better development in the state of total literacy.



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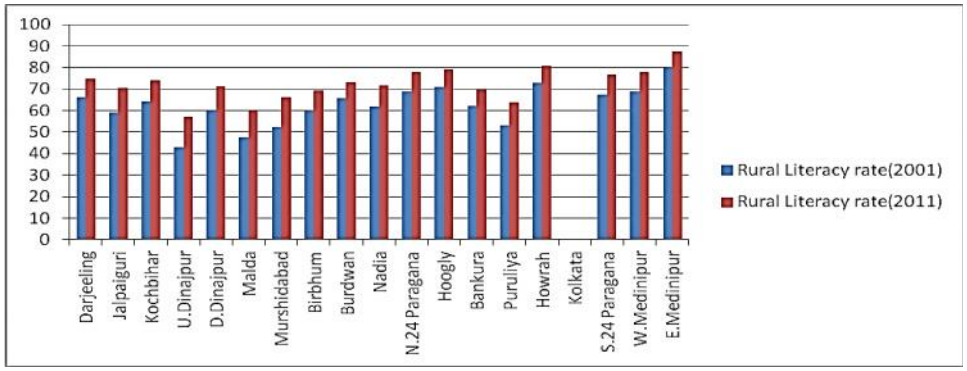

Figure: 9

According to 2011 literacy rates, East Medinipur scores the highest and Uttar Dinajpur the lowest in rural literacy rates. But again the rate of change in Uttar Dinajpur is very high.

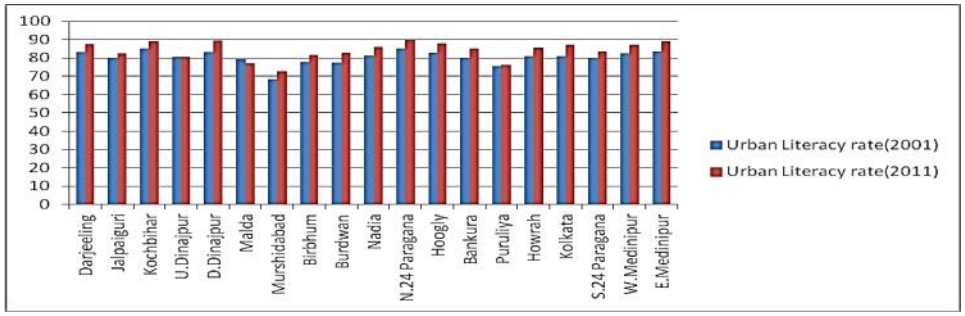

Figure: 10

From figure 10 it can be concluded that Murshidabad and Puruliya has the lowest urban literacy rates and the literacy rate have remained mostly same in Uttar Dinajpur from 2001 (80.5%) to 2011 (80.67%). Thus greater attention was given to the development of rural literacy in Uttar Dinajpur.

Comparison of Gender Disparity of Literacy

Inequalities still exist between different groups and different regions in terms of educational opportunities. These gets reflected in the literacy rates. Gender disparity is the differences that exist between males and females and spatial disparity refers to the inequalities existing between a rural and an urban area. Kundu and Rao's method has been used to find out the disparity index. Effective literacy rates has been used for the calculations.

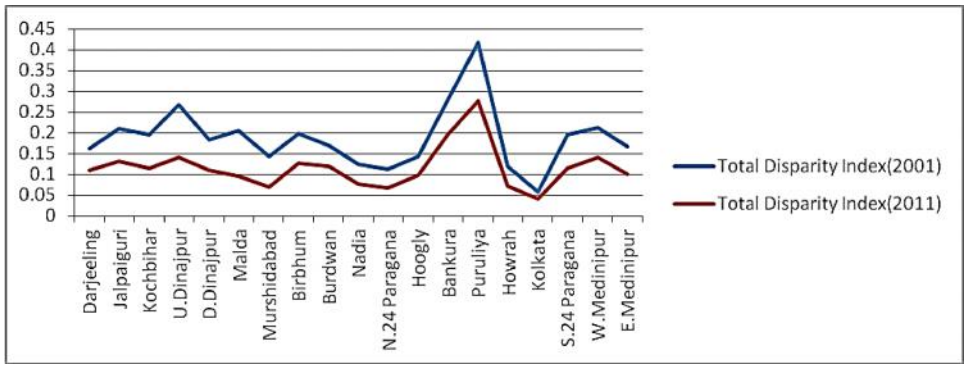

Figure: 11

From Figure11 it is clear that the gender disparity index has reduced from 2001 to 2011. Greatest reduction in disparity index is observed in Uttar Dinajpur, Malda and Murshidabad districts. Gender Disparity Index is very high in Puruliya. Though it has reduced from 2001, still it remains to be the highest among all other districts of West Bengal in 2011.

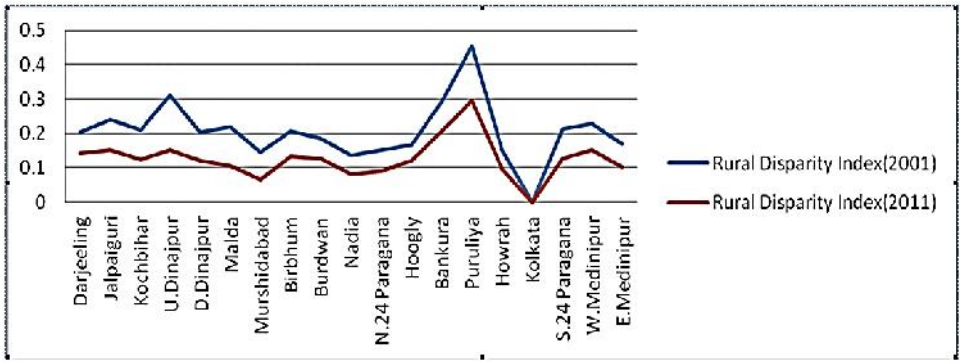

Figure: 12

Rural Gender disparity index is shown in Figure 12. Disparity index is very high in Puruliya. In Uttar Dinajpur, the disparity index has greatly reduced from 2001 to 2011. As there is no rural population in Kolkata, it is showing the least value. The disparity index is least in the district of Murshidabad.

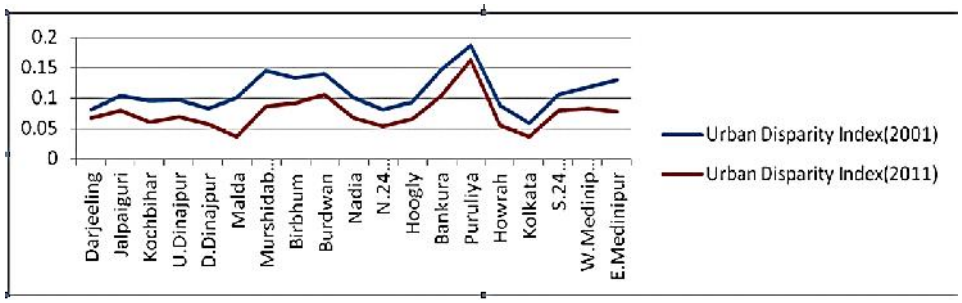

Figure: 13

The urban gender disparity index has not reduced like rural gender disparity index. Puruliya has the highest disparity in both 2001 and 2011. Lowest disparity index in 2011 is observed in the districts of Kolkata and Malda.

Inter-District literacy disparity of West Bengal

To measure the Inter-district literacy disparity, coefficient of variation (C.V) has been used. Effective literacy rates have been used for the calculations.

Table: 2 Coefficient of Variation (C.V)

	Male (2001)	Female (2001)	Male (2011)	Female (2011)
Total Literacy	0.115	0.205	0.089	0.136
Rural Literacy	0.123	0.20	0.093	0.129
Urban Literacy	0.038	0.068	0.051	0.071

Coefficient of variation is higher for female literacy rate in both 2001 and 2011 than male literacy rate thus indicating that inter-district variation is more for female literacy than male literacy. Similarly for both rural and urban literacy, female literacy has more inter-district variation than male literacy.

Conclusion

The study reveals that the average literacy rate of West Bengal is always higher than India's average. But there exist inter-district variation in literacy. Females of both urban and rural areas have a higher inter-district variation than males. This gap is needed to be addressed. Though female literacy rates have increased in all the districts of West Bengal but the disparity is very high in Puruliya. Thus Puruliya district needs special attention for upliftment irrespective of gender. It can also be concluded that the northern districts like Malda, Uttar Dinajpur and Murshidabad which had low literacy rates in 2001 showed remarkable progress in 2011. Thus education which can address

all other socio-economic disparities needs to be developed equally and distributed equitably.

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13

Masculinity Intention in Feminine Health and British Power in Malabar

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Abstract

By the early nineteenth century most of the wars in the South India were fought and the Madras army seemed to have subdued all its rivals. Yet the incidence of fatalities among European soldiers was increasing (one out of every nine white soldiers in the Madras army was reported ill in 1816). Increasingly, an analysis of the causes for the high mortality or more specifically the morbidity indicated that sexually transmitted disease/venereal disease (syphilis, gonorrhea and a range of penile chancres) was the principal threat to European life in India.

In the nineteenth and twentieth century administrators interest in regulating sexual conduct in Malabar incorporated not only the longstanding issue of sex as a potentially pathological act –venereal diseases –but sex as a reproductive act, the future population reproduction of the population was crucial for the bio-political state. In Malabar a marked decline in women's productivity was taken very seriously by government in the later part of nineteenth century. Government statistician and health experts tried to occupy new 'empty' space, gathered information on birth-control methods and usage, on abortion, on infant and maternal mortality rates, on venereal diseases and techniques of new space of confinement. British colonialism had made marked changes in the position of Malabar women from traditional view point to modern way of life and tried to generate a 'modern' cream of the crop class.

This paper intends to discuss the western medical system in colonial Malabar. The paper also tries to explore the major problems relating to venereal disease and prostitution in the state of Malabar. How the indigenous people responded towards western medical care? How the state formulated the policy to give special treatment to venereal diseases and women's responses towards it.

Both archival and secondary sources were used to prepare this paper. This paper is my attempt to describe the socio-economic contexts of venereal disease in

colonial Malabar. It also tries to explain how and why British highlighted European hegemony over indigenous population and culture of Malabar.

Keywords: *Venereal disease, Malabar, medicine, body*

My love is as a fever, longing still	My love is like a fever, still longing
For that which longer nurseth the disease,	For that which feeds the disease,
Feeding on that which doth preserve the ill,	Feeding on that which prolongs the illness,
The uncertain sickly appetite to please.	All to please the unhealthy desires of the body.

—William Shakespeare[1]

William Shakespeare in his sonnet said that how the unhealthy desires of the body pushing man towards illness or disease. By the early nineteenth century most of the wars in the South India were fought and the Madras army seemed to have subdued all its rivals. Yet the incidence of fatalities among European soldiers was increasing (one out of every nine white soldiers in the Madras army was reported ill in 1816)[2]. Increasingly, an analysis of the causes for the high mortality or more specifically the morbidity indicated that sexually transmitted disease/venereal disease (syphilis, gonorrhea and a range of penile chancres) was the principal threat to European life in India[3]. The productive power of discourse about sex and its relationship to control and discipline is the subject of discussion in recent days.[4]

Sustruta, in his *Ayurvedas*, describes diseases bearing resemblance to venereal infections[5], which, three thousand years ago were prevalence in India. The patriarchal order of the society produced a specific discourse on the woman's disease. Essentially gendered in nature, the discourse portrayed syphilis as a typically feminine disease. Women, particularly prostitutes, were seen as sole carriers of the syphilitic contagion, and the prevention of the disease got directly associated with their control. This deliberate gendering proved especially fruitful in colonial situations as it gave a free hand to the authorities to put the blame of the disease on the colonized other. It also provided a tool for the extension of 'colonizing space' through a control of the state over female privacy.

The British Empire in India began its expansionist trail from the late eighteenth century onwards; the problem of venereal disease began to figure in a new way. Right from the beginning, officials recognized the incidence of venereal disease to be result of sexual indulgences between soldiers and the prostitutes, an area which was 'most troubling' and 'embarrassing' to the authorities. The mutiny of 1857 essentially came as a break. It reoriented the concern regarding the disease as, upon enquiry, the officials found that at least the disease as, upon enquiry, the officials found the at least one – third of the European troops was perpetually in hospitals on account of this disease alone. The Mutiny was a shock that hit at the very foundations of the empire, and such revelation as the number of soldiers afflicted with venereal disease left the rulers unnerved. To look into the deeper aspects of the problem, the government instituted a

Royal Commission for enquiry into the sanitary conditions of the army. This facilitated the way for legislations like Act XXII of 1864 and the Indian Contagious Diseases Act, which created a legal framework for the prevention of venereal disease. Venereal disease becomes a marker to understand how, in order to overcome its own fears; the authorities came to refine the roles of the colonizers and the colonized in this period, and sought to control the subject society.

The popular conception of a prostitute as a woman who temporarily loans the use of her body to a miscellany of men in return for money, is obviously too narrow and restricted.[6] The opposition to prostitution mainly connected with the fear of venereal disease. It is significant that the initiation of the many attempts to stamp out prostitution in Europe were coincident with the outbreak of epidemics of syphilis[7] or gonorrhoea[8]. Previous to this time there would appear to have been no connotation made anything between prostitution and venereal infection. Medical science, such as it was, had done little investigation into the nature of the diseases now known as syphilis and gonorrhoea[9].

In ancient literature there are no recorded references to syphilis or gonorrhoea specifically as such. But there are references to "the plague" and to the "great pox"; there are references to "running issues"; and there is little room for doubt that leprosy was often confounded with syphilis[10]. The syphilis, in particular, there seems grounds for thinking that 'racial syphilisation' is possible and this provides an explanation for those long periods of apparent quiescence which mark the medical history of civilization. In later half of the 19th century, the Lock Hospital, founded "on the site of a house for venereal patients". In Great Britain there is in force a voluntary system of treatment for those infected with venereal disease[11].

Ronald Hyam observes that the British Empire in India was an outcome of the sublimation of the sex among young male adults that accounted for their 'extraordinary military aggressiveness'. Drawing a direct relationship between the creation of the British Empire and sexual opportunity he said, "The Pax Britanica was also a 'Pox Britanica'. British spread venereal diseases around the globe along with its race- courses and botanical gardens, steam engines and law books. It could be clear that whole trade of prostitution was the ever increasing demand for it among young British soldiers in the colonies"[12]. As one report said,

"For young man who cannot marry and who cannot attain to the high moral standards required for the repression of physiological natural instinct, there are only two ways of satisfaction, viz., masturbation and mercenary love. The former, as is well known, leads to disorders of body and mind; the latter, to the fearful danger of venereal."[13]

British had brought about a radical shift in the very perception of the prostitute as an individual and a professional. Away from the traditional perception of the prostitute as belonging to a marginalized class, staying at the periphery out of necessity and to fulfill certain social needs, she had emerged as a criminal at the centre stage of the colonial rule—as one who infected the colonizer and de-musculinized him. This identity of prostitute as a criminal was an important transformation brought about by the British

rule in India, and was typically colonial in nature. It also had an important bearing upon the treatment of prostitutes as subjects in the preventive discourse of the state.[14]

Before the discussion of venereal diseases I like to highlight the history of women's treatment in Malabar District. Up to the earlier 1885s the European treatment mainly concentrated on manpower and especially they preferred only for 'male production'[15]. The health care of women was of no concern in this colonial perspective nor was it considered a state responsibility. The issue of giving special treatment to women's health in India had come as early as the 1880s. In 1885 Queen Victoria, receiving information about the poor state of medical health for women in India, urged the new Vicereine, Lady Dufferin, to do what she could be promote medical aid to India's women. This resulted in the formation of Dufferine Fund, but brought little difference to the Government's policy[16]. In 1902 the government opened a hospital for women and children at Calicut. The funds for this were contributed almost entirely by the philanthropism of Sir Ramaswami Mudaliar. Shortly afterwards Government opened a dispensary for women and children at Palghat, but it was abolished in 1909, for the lack of popular support towards its maintenance[17], with the result that Calicut hospital was only medical institution for women in Malabar till the 1950s.

Political historians have find out the little connection between sexually transmitted diseases and the business of politics and governance. Attempts to control the health of soldiers through the control of the women with whom they slept were not new to India in the 1860's[18]. Before the imposition of direct rule in 1858, local enactments had established regular examination of women as well as hospitals for their reception when diseased. In 1805, what may have been first venereal "Lock" hospitals in India were established in the Madras Presidency under the supervision of the civil magistracy. Thereafter, such hospitals opened and closed in presidencies according to finance, the temperament of the local medical officer, and other such variables. It was only with the more organized efforts of government and the military authorities in the 1860s that the system came to be established on a more secure and permanent footing[19].

Folly's text clearly demonstrates feeling among European doctors towards Indian doctors and Indian medicines. On one hand, he sees the "Malabar" doctors as superstitious quacks with very little knowledge of medicine and none at all of surgery, on the other, he was very eager to find the precise textual sources for their metallic drugs. Possibly in order to find a better treatment for Venereal diseases (particularly syphilis). His assumptions seem to follow the patterns outlined above in the sense that he perceives the Indian doctors as only having erroneous knowledge of medicine, where as their authoritative texts might contain the precise and correct art of original medicine. Therefore he was in search of the original sources of indigenous medical knowledge[20].

The area of Calicut also included in the rules for the prevention of the spread of venereal diseases in cantonment. The rules for the prevention of the spread of venereal diseases applied to the villages half a mile north of west Hill barracks in the Calicut cantonment[21].

If we go through the disease statistics of in the troops of Malabar District venereal diseases comes second (bowel disease comes first) the reports from 1834-38 in native troops of Cannanore region shows that the total number of patients admitted 932, however no deaths takes place[22]. However in European troops[23] that admitted death and statistics mentioned below:

Year	Place	Admitted	Death
1829-41	Calicut	77	—
1834-38	Cannanore, Calicut, Mangalore	478	04
1834-38	Quilon	94	—

The report of 1886 stressed that venereal and syphilitic complaints found during this period in towns. It has highly furious in nature. It has met with among the rich and poor of all creeds[24]. Civil apothecary V. Jesudasan said that "the disease, I regret to observe, has not confined to the profligate, but permeates the domestic life of the more respectable. And one reason why hospital returns do not bear out this statement depends upon the widespread presence of the disease of the disease and on the success with which its milder forms are eradicated not only by the hakims, who practice, in tolerable number, on the credulity, superstition and ignorance of the people, but by patients themselves. Mercury in its crude form is their only medicinal panacea"[25].

For Venereal disease deaths administrators complained that the sides of public roads and streets are thickly populated by prostitutes, which facts accounts for the increase in venereal affections in Calicut town[26]. For the prostitution profession, there was no opposition in the society of Malabar and it has considered being as a common profession of the people. There was a high demand for these forms of women in society[27]. Compare to other stations of Madras Presidency Malabar area had highest people who had suffering from venereal disease[28].

Stations	Affected	Admitted	Death
Calicut	89	15	—
Penang	78	5	—
Vizagapatam	77	—	—
Seetabuldee	66	24	—
Chindwarrah	45	17	—
Ramandroog	42	7	—

The health of the British officers, women and children had overall been good. The report contains statistical evidence showing decided decrease in the prevalence of 'contagious diseases' since the establishment of Lock hospitals[29] in Malabar.

Venereal disease in the Presidency of Madras[30]

British had started Lock Hospitals not to protect Malabar women from dreaded disease but to protect British civilian population from the diseases such as syphilis and

gonorrhea. If they had any interest in women's care means why they not started any women's hospital in Malabar up to 1902? Moreover British had high difficulties to give accommodation facilities for the families of soldiers.

Before the Act

Year	Per mille
1866	562.2
1867	412.7
1868	435.8

After the Act

Year	Per mille
1869	231.9
1870	186.4
1871	174.2

The prominent feminist writer Jaya Devika's, *En-gendering* highlights the women and her role in the socio-cultural level of Malabar. Indian women has been used by Europeans especially soldier and army men for their psychosexual need on the one hand and the changing concepts of Malabar women as the result of modernity and westernization on the other[31]. Europeans 'utilized' Indian women and from that, they invited different forms of venereal diseases such as syphilis, gonnoria etc. Finally blamed for 'Indian women' for the 'cause' of diseases and death, their insanity, ignorance and unawareness regarding health became easy way for administrator to escape from their responsibility. In colonial records highlighted that Malabar women's are dangerous they are always carrying with the seeds of 'big pox'. Who has the responsible for the spread of Venereal diseases in Malabar? Whether British or Malabar women? *Engendering* highlighting how the British policies gendered Malabar society and women through the weapon of education. Their reforms converted human beings from 'natural' to 'gendered' specific individual[32].

Another one of the thing that has highlighted by Europeans in Malabar women was their dress habits. Nakedness of the women in the upper part of the body or uncovered blossoms became the one cause of the soldiers' attraction towards Malabar women. European women and army men blamed for 'Malabar women's dress habits and not the 'weakness' of European civilian population. However, women's dressing has the part of Malabar culture and there having no any sexual importance. As the result of European domination highly respecting Malabar women's position changed him as a 'prostitute'. The result of European hegemony, the concept of 'dressing of body' has also developed as the result of all these ideologies[33].

Moral responsibility has very lesser to European population and Anglo-Indian children deprived of from their parental love, affection and protection. 'Indian mother' has only responsible for protection of the child with her little income. 'Uncivilized notion' of

Europeans we need to apply whether Indian or European population? As the result of the increased number of Anglo-Indian, population there aroused a serious tension of purity of race.

In case of Lock Hospitals in the presidency districts, British had given treatment to Indian women not to protect Indian women from venereal diseases but also to protect army men from the spread of diseases. They had prepared Indian women for the European men from Indian cost itself. This has not only the matter of emotional problems of army men but also European 'profit motive'. The sheltering of the family of soldiers has one of the most difficult matter and the matter of 'finance'. British Commander General himself had given permission to continue the profession of prostitution in the cantonment area of Cannanore region. Whatever things or policies done by the British in Malabar had a few masculine intentions behind that and not for the sake of women.

Concluding Remarks

How can we explain the problems of venereal disease in 19th century Malabar? Whether it was the defect of the women or their profession of prostitution to collect their daily bread? Whether British administrators failed to maintain healthy sexual contact in the cantonment area? However, the matter was as much moral and financial, as it was racial. When did the British administrators awaken to the problem of venereal diseases? The answer is very clear. When the death rate increased in the British Indian army and when the number of Anglo-Indian population increased, tension over racial purity was developed.

This problem of a mystifying aetiology of the disease was compounded by the questions of morality associated with syphilis. The disease became a metaphor which not only reflected the deeper immoral moorings of the society; its control meant public intervention in otherwise private spaces of individuals, and rigid control over and regulation of their sexual activities. More importantly, contending with the menace of syphilis involved a social and medical reconstruction of 'sick' and 'healthy', with a focus upon the sanitary state of the sexual organs of individuals.[34]

The British used a method to control venereal diseases by compulsory registration of prostitutes as well as setting up of "lock hospitals". The nineteenth century hospital records do not speak much about the venereal disease. Only, the Malabar Gazette and gazetteers highlighted the seriousness of the disease, especially in the region of Cannanore. It may be noted that in the last quarter of the nineteenth century, in other parts of British India, venereal diseases played havoc with the lives of people. The preventive as well as creative measures taken by the colonial government, not only angered the Indians, but also provoked the Indian youth to take recourse to military activities.

The lock-hospitals more or less, kept functioning along the set pattern, a century-old progress of medical science and personnel hardly contributing anything towards their improvement. In imperial perception, the sex workers were viewed as vectors rather than victims of the disease.[35] Hence, the administrative focus was on preventing

soldiers from being infected by them and not vice-versa. The Indian response to this socio-military and socio-medical problem was one of the studied indifference. The spectacle of a few thousand of Indian women surrendering themselves to the lust of the British soldiers was hardly a matter of any concern either to the feudal classes or to the rising Indian middle classes. Despite the whole affair of the regimental brothels being ethically repulsive and medically mismanaged, it ought to be conceded, however, that the imperialists were at least not hypocrites as they frankly accepted and lawfully operated one of the oldest professions of mankind.[36]

There is an obvious contradiction between the care with which the military authorities provided facilities for sexual relations between British soldiers and native women, and the care with which other authorities tried to discourage sexual relations between British officials and native women. In both cases the fundamental concern was to preserve the structure of power. In the one case the soldiers' virile energies had to be maintained. In the other case the social distance between the official elite and the people had to be preserved.[37]

The Malabar women's concept of 'touching of body', 'dressing of body'[38] and 'testing of body' was changed simultaneously as the result of the development in the field of women and her health. However British cannot be blamed for the system of prostitution in Malabar. The question of venereal diseases and its prophylaxis is to some extent connected with the abnormality and low fertility rate among the women prostitutes of Malabar.

The late nineteenth century revealed the paradoxes within the Indian response to state intervention on this sensitive issue in the cities of Malabar. In the year 1888, the Contagious Diseases Act was passed by government of India because "there appears to be no doubt that the good that it affects is apt to be misinterpreted while its enforcement involves interference in the private concerns of many persons, which is apt, unless the supervision be effective, to lead to great abuse and which is not justified unless counter balancing advantages are secured".

The question of venereal diseases and its prophylaxis is to some extent connected with the abnormality and low fertility rate among the women prostitutes of Malabar. Every time talking about venereal diseases administrators blamed women's because they are the source of 'sources of infection' and not a much more role to men in this case.

Endnotes

1. Shakespeare, Paraphrase, Sonnet No. 147.
2. Peers, Douglas M. Between Mars and Mammon: Colonial Armies and Garrison State in India 1819-1835, New York, 1995, p. 83.
3. Neema Cherian, Spaces for Races: Ordering of Camp Followers in the Military Cantonments, Madras Presidency, C.1800-64, *Social Scientist*, **32**(5/6): 32-50 June, 2004.

4. Lawrence D. Kritzman, Michel Foucault Politics, Philosophy, Culture Interviews and other writing 1977-1984, Routledge, 1988. p. 111.

5. Venereal disease is a Contagious Disease (as gonorrhea or syphilis) that is typically acquired in sexual intercourse.

6. George Riley Scott, *History of Prostitution: From Antiquity to Present*, Shubhi Publication, 1999, Delhi, p. 3.

7. Syphilis is a sexually transmitted disease caused by the spirochete Treponema palladium. Without treatment, it may progress through three stages: primary, characterized by a chancre and low fever, second with a skin and mucus – membrane rash, lymph node swelling, and bone, joint eye and nervous system involvement; and tertiary. The tertiary stage follows a latency period that can last years and only one – fourth of those infection display tertiary symptoms. Several blood tests can detect syphilis, even during latency. Antibiotic treatment is effective.

8. Gonorrhea is characterized by genitourinary inflammation, caused by the bacterium Neisseria gonorrhoear (gonocouus) symptoms in men include burning on urination, discharge of pus, and with deeper infection frequently urination, sometimes with blood. Women may have mild vaginal discharge and burning, but there is usually no sign until a sex partner is infected or complications-sometime serious–arise from its spread beyond the cervix.

9. Syphilis was first used in reference to venereal disease in 1530, by Fracastro, in a poem entitled *Syphilis Sive Morbus Gallicus*. The bacillus of syphilis was not identified until 1895, when Schaudim named it Spirochaeta pallid, and shattered for all time John Hunter's thesis that syphilis, gonorrhoea and chancre all resulted from infection with one organism.

10. Much of the controversy over the origin of the venereal infections is coloured by moral and religious prejudices; and there is a tendency for each country to put the blame on some other country.

11. George Riley Scott, *History of Prostitution: From Antiquity to Present*, Shubhi Publication, 1999, Delhi, p. 151.

12. Hyam Ronald, 'Empire and Sexual Opportunity', Journal of Imperial and Commonwealth History, **17**(1) Oct, 1988.

13. Sabya Sachi R. Mishra, "An Empire 'Demasulinized'! : The British Colonial State and The Problem of Syphilis In Nineteenth Century India "in Deepak Kumar, (ed.) *Disease and Medicine in India: A Historical Overview*, Indian History Congress, Tulika, New Delhi, p. 170.

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17. Government of Madras, Annual *Returns in the Civil Hospitals in the Madras Presidency*, 1909.

18. Mark Harrison, "Tropical Medicine in Nineteenth Century India", *British Journal of the History of Science*, **25**, 1992, pp. 299-318.

19. Philippa Levine, Venereal Disease, Prostitution and the Politics of Empire: The Case of British India, *Journal of the History of Sexuality*, Vol. 4, No. 4, April. 1991, pp. 579-602.

20. Niklas Thode Jensen, 'The Medical Skills of the Malabar Doctors in Tranquebar, India, as Recorded by Surgeon TLF Folly, 1798'. *Medical History*, 2005, October, pp. 489-515.

21. GO. No. 7031, M., dated, 22nd July, 1901.

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25. Financial, No. 883 M., 2nd September 1886.

26. Local and Municipal, No. 651 M., 11th July 1887.

27. Mukkundan M., *Mayyayipuleyude Thirangayil*, Malayalam Novel.

28. Report on Sanitation of Madras Presidency for the year 1869.

29. Report on Sanitation of Madras Presidency for the year 1870.

30. Report on Sanitation of Madras Presidency for the year 1873.

31. Devika J, *En-Gendering Individuals: The Language of Re-Forming in Twentieth Century Keralam*, Orient Blackswan, 2007, p. 266.

32. Dan Brown, *The Da Vinci Code*, Random House Large Print, 2004.

33. Devika J .Op. cit, "…Nair did not think it shameful to speak of breasts. Because they did not cover them … (even) when family members were together, speaking freely of certain parts of the body was not prohibited".

34. Sabya Sachi R. Mishra, "An Empire 'Demasculinized'! : The British Colonial State and The Problem of Syphilis In Nineteenth Century India "in Deepak Kumar, (ed.) *Disease and Medicine in India: A Historical Overview*, Indian History Congress, Tulika, New Delhi, p. 167.

35. Manderson, Lenore, *Sickness and the State: Health and Illness in Colonial Malay 1870-1940*, Cambridge, 1996, p. XV.

36. Anil Kumar, *Medicine and the Raj British Medical Policy in India*, 1835-1911, New Delhi, 1998, p. 110.

37. Kenneth Ballhatchet, *op.cit,* p. 164.

The stereotypes which were formulated to defend this social distance and to justify the privilege of the ruling race proceeded by a circular reasoning which ignored inconvenient evidence.

38. Jennie Batchelor, *Dress Distress and Desire: Clothing and the Female Body in Eighteenth Century Literature,* Macmillan, 2005, pp. 158-160.

Jennie Batchelor's work explores the way sartorial metaphors function in eighteenth century British culture to cover a wide array of issues, extending beyond fashion to encompass female issues the domestic woman, sensibility, commerce, prostitution. Since as Batchelor points out, dress function as a "symbol that can various connote wealth, social status, sexuality and moral probity ...it always has been and probably always will be, a site on which multiple and often competing anxieties are simultaneously focused".

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14

Intertemporal Employment Growth in Indian Agriculture: A Decomposition Analysis Using NSS Data

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Abstract

Using a decomposition framework, an attempt has been made in this paper to study the component forces namely, (i) Productivity Change Effect, (ii) Pure Growth Effect, (iii) Structural Change Effect and (iv) Interaction Effect operating in the employment growth of Indian agriculture especially during the reform periods. The results of our study suggest that the output growth is not associated with matching employment growth in Indian agriculture in the post reform periods and the factor responsible for the employment growth in early post reform phase is basically the 'pure growth effect'. The impact of 'productivity change effect' is observed in the later phase of post reform period. The 'structural change effect' is less evident in changing pattern of the size of employment. As more and more time passes, liberalization gets deepen and the consequences of relaxation of controls is manifested possibly through the capital deepening labour saving production structure of the Indian agriculture. It seems that time has come to look beyond agriculture for rural employment and in this context the rural non-farm activities may deserve some reprioritization in our development thinking.

Keywords: *Cross effect, pure growth effect, productivity change effect, structural change effect.*

Introduction

Indian economy followed a model of planned economic development till about 1980. Though a wide industrial base was developed because of this, but the economy could not escape from low rate of growth, poor productivity and industrial stagnation of the 1960s and 1970s. Since 1991, following economic policy reforms, the industrial and trade policies of India have undergone several changes with the prime objective of globalization of the economy where the changed economic environment is expected to bring market forces to operate with lesser constraints. One important feature of this

policy shift has been the curtailment of the role of Govt. giving top most priority to the relaxation of Govt. controls in various economic activities like production and trade thereby ushering a new era of economic liberalization. At the time of the introduction of economic liberalization in India in 1991, there was not much about the reforms in agriculture. But as soon as the WTO came into the picture in mid-1990s, Indian agriculture was exposed to many policy reforms.

The economic liberalization package in agriculture focuses mainly three areas- External Trade Sector, Internal Market Liberalisation and Fiscal Reforms. International trade in agriculture is liberalized emphasizing mainly the liberal import of agricultural products. All Indian product lines are placed under Generalised System of Preferences (GSP). All most all agricultural products are removed from Quantitative Restrictions (QRs) and brought under tariff system. Trade trading agencies are replaced and most of the products are brought under Open General Licensing (OGL). The average tariffs on agriculture products are reduced significantly. As the measures related to Internal Market Liberalization, trade in High Yielding Varieties (HYV) seeds was opened to private trade, hundred percent foreign equity was allowed in seed industry and restrictions on import of seeds were relaxed. Fertiliser subsidy was reduced noticeably. 'Power and water' incentives were withdrawn, Power tariff increased and power sector was thrown open to private sector investment. Water rates were revised upward. The commercial banks and the Regional Rural Banks are given the additional responsibility of priority lending to weaker sections in rural areas. The relaxation of restriction on the interstate movement of farm produce, enactment of model agricultural market act and encouragement of Contract Farming are the crucial reform measures related to agricultural marketing. In the fiscal front, the measures are directed towards giving emphasis on tax reduction and public expenditure in order to reduce fiscal deficit.

All these measures had implications for the farm sector. The most prominent manifestation of these measures is the remarkable deceleration in agricultural growth in general and agricultural exports in particular. The drastic decline in the growth rate of agricultural GDP and exports points to the acute agrarian crisis which have affected the vast majority of the population.

Given the sweeping economic reforms that have taken place in India since 1991, it seems important to see if there have been any significant changes in the agricultural productivity especially in the 1990s and 2000s. It is also important to see how productivity growth and structural changes in the agriculture have resulted in significant changes (if any) in the structure and size of employment. In order to do this, we have adopted a simple decomposition analysis, similar to 'Shift-Share' kind, to separate out the component forces namely, (i) Productivity Change Effect, (ii) Pure Growth Effect (Size Effect), (iii) Structural Change Effect and (iv) Interaction Effect (Cross Effect) of (i), (ii) and (iii) operating behind the employment growth of Indian agriculture.

So, the paper is organized as follows:

After highlighting the reform measures undertaken in Indian agriculture and

mentioning the objectives of this paper in section-I, relevant literatures are surveyed in section-II. Section-III presents the data base of the study. Section-IV discusses the methodological framework. The results of our study are outlined and interpreted in section-V. Finally, section-VI concludes with some policy implications.

Literature Survey

It is generally observed that in the growth process of countries, particularly the developing ones, there appears a conflict (real or apparent) between the 'output objective' and 'employment objective'. Of course, neither of the objectives, maximum output nor maximum employment is possibly unambiguous. In the real life, output consists of heterogeneous bundle of goods. Employment also may vary in duration, in effort and by region. Not only that, output and employment growth occur over time. Sacrifices now may yield gains in future. We may have the situation as follows: First, where more production and less employment now leads to more production later than would otherwise have been possible. The intertemporal trade-off between employment now and employment tomorrow arises because, by tolerating more unemployment now for the sake of more output now, it may be possible to make provision for more employment later. The choice now presents itself as one between different time paths of output and employment.

Unfortunately, though there is a wealth of literature dealing with the theoretical issues involved in the GDP and employment growth pattern of a country, rarely attempts are seen to have been made to analyze the output employment trade-off empirically or more specifically to have a decomposition of employment growth for specific geographical regions over certain length of period.

It has been shown by Fei and Renis (1963) that the growth path of industrial employment opportunities and output depends on the strength of two forces as follows:

1. Capital Accumulation
2. Technological Change

The greater the rate of capital accumulation, the greater the rate of expansion of industrial employment and output. It is also possible that in an economy with high surplus labour, innovation can also have significant impact on the above especially if they are with high intensity and are biased in the labour using direction thus making it possible to utilize abundant labour. Of course, unfortunately in the LDC's the experiences in the recent decades give ample evidences of adoption of more and more labour saving rather than labour using innovation process. The labour saving technological change results in capital deepening rather than capital widening and whatever capital accumulation takes place results in relatively very little employment generating effects. Basically, Fei and Renis (1963) derived a labour absorption equation defining the rate of industrial employment expansion in the framework of a two sector economy where the implication of the structural change in the industrial sector itself for industrial employment expansion could not be captured. Based on the ideas as applied by Fei and

Renis (1963) to the industrial employment and output expansion, in this paper, we have made an endeavour to study the output-employment trade off in Indian agriculture during the post reform periods along with the contribution of component forces operating in the employment growth of Indian agriculture.

Methodology

As indicated earlier, we have adopted a simple decomposition technique of 'Shift-Share' kind to segregate the employment growth of Indian agriculture over three phases namely, Phase-I (1999-00-2004-05), Phase-II (2004-05-2009-10) and Phase-III (1999-00-2009-10) into the following four components:

1. Productivity Change Effect.
2. Pure Growth Effect (Size Effect)
3. Structural Change Effect
4. Interaction or Cross Effect of (1), (2) and (3)

The 'productivity change effect' as mentioned above refers to combined effect of capital deepening and technological change. Capital deepening implies use of more capital per unit of labour. Obviously, the direct short run effect may be a possibility of reduction in employment per unit of output. Increased use of capital does not necessarily lead to reduction in the employment growth so much if immediate decline in employment consequent to increase in labour productivity caused either by technology change or by capital deepening or by both is cancelled out by output growth. This is the second component as mentioned above (growth effect). Of course, though capital deepening itself will tend to contribute to fall in employment in the short run, improved technology if it is capital saving (Labour using variety), then technical progress will contribute to direct increase in employment in the long run. If improved technology is of labour using variety possibility of more employment will take place through some capital being substituted by labour.

This is the case when both capital and labour productivity will grow simultaneously. In the long run substantial increase in output made possible through enhanced capital widening itself (expanded capital stock created by growth effect) will tend to generate significant amount of new employment. Capital deepening may occur through increased physical capital per unit of labour. It is also possible that more and more human capital associate with each unit of labour will result in increased productivity. The third component mentioned above relates to the change in the industrial composition. As some sectors are relatively more or less labour intensive than some other sectors, significant change in the composition of industrial output may contribute to substantial growth/decline in employment.

For the decomposition technique, which is adopted here, to find out the contributing factors in the agricultural employment growth , following identity of 'Shift-Share' kind has been used.

$$L_i^t - L_i^0 = L_i^t/X_i^t \,.\, X_i^t - L_i^0/X_i^0 \,.\, X_i^0$$

$$= L_i^t/X_i^t \,.\, X_i^t + L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0 - L_i^t/X_i^t \,.\, X_i^0$$

$$= L_i^t/X_i^t \,.\, X_i^t + (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^t/X_i^t \,.\, X_i^0$$

$$= L_i^t/X_i^t \,.\, X_i^t + (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^t/X_i^t \,.\, X_i^0 + L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t / \Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0 + L_i^0/X_i^0 \,.\, X_i^0$$

$$= L_i^t/X_i^t \,.\, X_i^t + (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^t/X_i^t \,.\, X_i^0 + (L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t / \Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0 + L_i^0/X_i^0 \,.\, X_i^0$$

$$= L_i^t/X_i^t \,.\, X_i^t + (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^t/X_i^t \,.\, X_i^0 + (L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t / \Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0 + L_i^0/X_i^0 \,.\, X_i^0 + L_i^0/X_i^0 \,.\, X_i^t - L_i^0/X_i^0 \,.\, X_i^t$$

$$= L_i^t/X_i^t \,.\, X_i^t + (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) - L_i^t/X_i^t \,.\, X_i^0 + (L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t / \Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^t - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0) + L_i^0/X_i^0 \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^t$$

$$= (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^t - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0) + (L_i^t/X_i^t \,.\, X_i^t - L_i^t/X_i^t \,.\, X_i^0 + L_i^0/X_i^0 \,.X_i^0 - L_i^0/X_i^0 \,.\, X_i^t)$$

$$= (L_i^t/X_i^t \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0 - L_i^0/X_i^0 \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^t - L_i^0/X_i^0 \,.\, X_i^0 \,.\, \Sigma X_i^t/\Sigma X_i^0) + \{(L_i^t/X_i^t \,.\, X_i^t - L_i^t/X_i^t \,.\, X_i^0) + (L_i^0/X_i^0 \,.\, X_i^0 - L_i^0/X_i^0 \,.\, X_i^t)\}$$

$$= (l_i^t \,.\, X_i^0 - l_i^0 \,.\, X_i^0) + (l_i^0 \,.\, X_i^T - l_i^0 \,.\, X_i^0) + (l_i^0 \,.\, X_i^t - l_i^0 \,.\, X_i^T) + (l_i^t \,.\, X_i^t - l_i^t \,.\, X_i^0) + (l_i^0 \,.\, X_i^0 - l_i^0 \,.\, X_i^t)$$

$$= X_i^0 (l_i^t - l_i^0) + l_i^0 (X^T - X_i^0) + l_i^0 (X_i^t - X^T) + (l_i^t - l_i^0)(X_i^t - X_i^0) \ldots\ldots\ldots\ldots (1)$$

Where L^t = Total employment at time *t*.

L^0 = Total employment at time 0.

X_i^t = Output of i^{th} sector at time *t*.

X_i^0 = Output of i^{th} sector at time 0.

X_i^T = $X_i^t \,.\, \Sigma X_i^t / \Sigma X_i^0$: Output of i^{th} sector in year *t* assuming the structure of production remains same as in year o.

l_i^t = L_i^t / X_i^t : Employment output ratio of i^{th} sector at the period *t*.

l_i^0 = L_i^0 / X_i^0 : Employment output ratio of i^{th} sector at the period 0.

The first terms of the R.H.S. of (1) isolates the effects of change in productivity on employment expansion (holding the growth and structure of output constant). Obviously it combines the effect of (1) increased or decreased capital intensity (capital deepening or shallowing) (2) technical progress which may be neutral, labour saving or capital saving. The second term indicates the size effect (Effect of Pure Growth).

In fact, it captures the effect of capital widening on employment expansion. The third term seeks to measure the effect of change in the sectoral composition of industrial output, holding the sectoral productivity and overall size of output unchanged. The last term is the cross effect term. It indicates the combined effect of all the three factors working simultaneously. Obviously if the size of cross effect term appears quite large, it will mean that the economy experiences significant amount of changes in labour productivity growth and structure of production simultaneously making it somewhat less appealing to use the identity results as a basis for attributing the observed employment expansion to one factor or the other. In that case the implementation of the identity just helps to provide some notional indication in respect of the magnitude of the contributing factors to employment growth.

Data Base of the Study

The data base of our study have been official reports, journals and books which are mainly of secondary types. While NSS employment and unemployment surveys, various rounds and report of the Task Force on Employment Opportunities (Planning Commission) give information in respect of number of employees and National Accounts Statistics published by CSO, Govt. of India provides value of output etc. Output figure in different sectors of India in different years as reported by NAS expressed in current prices are converted into constant prices of 1995-96 using appropriate index numbers reported in Statistical Abstract various uses published by C.S.O. Govt. of India.

Our study period relates to 1999-2000, 2004-05 and 2009-10 which can be termed as late liberalization periods. We have demarked our entire study periods into three phases like Phase-I (1999-00-2004-05), Phase-II (2004-05-2009-10) and Phase-III(1999-00-2009-10). We have chosen the years of our study keeping in mind the fact that by the years the impact of liberalization was recognizable and the liberalization progressed sufficiently so as to make substantial impact on the economy.

Results and Interpretations

This section focuses on the results of our empirical study presented in tables 1,2,3 and 4. A look into the tables reveal the output and employment growth pattern as well as the effect of contributing factors on the employment expansion of agricultural sector.

Output and Employment Growth Pattern

Table 1 presents employment scenario in agriculture over the period 1999-00 to 2009-10. As indicated in the table, in 1999-00, employment was 237.67 million. It increased to 258.93 million in 2004-05. Over the period 1999-00-2004-05, absolute increase in employment was 21.25 percent. But in 2009-10, employment decreased to 244.85 million. Over the period 2004-05-2009-10, net absolute decrease in employment was (-)14.08 percent.

As far as percentage share is concerned, it is observed that employment in unorganized sector far exceeds the organized sector. Percentage share of organized

employment in total employment was 2.31 percent in 1999-00, 2.37 percent in 2004-05 and 1.12 percent in 2009-10, whereas during the same years, it was almost 97 percent for unorganized employment.

Table 1: Employment in Agriculture (In Million)

Year	Employment		
	Organised	Unorganised	Total
1999-00	5.47 (2.31)	232.2 (97.69)	237.67
2004-05	6.09 (2.37)	252.8 (97.63)	258.93
2009-10	2.74 (1.12)	242.11 (98.88)	144.85

Source: Mehrotra, Gandhi, Sahoo and Saha (2012), Economic and Political Weekly, May 12, 2012 Vol. XLVII, No. 19.

Note: Figures in the parenthesis indicate percentage to the total.

Table 2 highlights the estimated GVA in Agriculture. It is observed from the table that GVA in agriculture in 1999-00 was ₹ 446515 Crore. It increases to ₹ 536629 Crore and further to ₹ 651901 Crore in 2004-05 and 2009-10 respectively. Over the period 1999-00-2004-05, GVA increases by 20.18 percent. There was no substantial improvement in GVA over the period 2004-05-2009-10. For the overall period (1999-00-2009-10), GVA increases by 45.99 percent.

It is also observed from the table that GVA in unorganized agriculture significantly exceeds the organized sector. Percentage share of organized GVA in total GVA was 3.45 percent in 1999-00, 5.52 percent in 2004-05 and 7.65 percent in 2009-10, whereas during the same years, it was more than 90 percent for unorganized GVA.

Table 2: Estimated GVA in Agriculture (In Crore at Current Price)

Year	GVA		
	Organised	Unorganised	Total
1999-00	15384 (3.45)	431131 (96.55)	446515
2004-05	29639 (5.52)	506990 (94.48)	536629
2009-10	49854 (7.65)	602047 (92.35)	651901

Source: Mehrotra, Gandhi, Sahoo and Saha (2012), Economic and Political Weekly, May 12, 2012 Vol. XLVII, No. 19.

Note: Figures in the parenthesis indicate percentage to the total.

Table 3 shows the output and employment index for Indian agriculture . A look into the table reveals the following :

Table 3: Output and Employment Index for Indian Agriculture

Year	Output Index			Employment Index		
	Organised	Un-organised	Total	Organised	Un-organised	Total
1999-00-2004-05 (Phase-I)	192.66	117.59	120.18	111.33	108.87	108.94
2004-05-2009-10 (Phase-II)	168.20	118.74	121.48	44.99	95.77	101.13
1999-00-2009-10 (Over all Phase)	324.06	139.64	145.99	50.09	104.26	103.12

Source: Author's Own Calculation.

In the Post Reform Phase-I (1999-00-2004-05), 20.18 percent growth in net output of agriculture sector supported a growth in employment of the order 8.94 percent. The trend continued in the Post Reform Phase- II (2004-05-2009-10) as we see that around 21 percent growth in net output was associated with a growth in employment of around 1 percent. In Over All Post Reform Phase (1999-00-2009-10), around 45 percent growth in net output supported only 3 percent growth in employment.

As far as organized and unorganized sectors are concerned, we observed that, in Post Reform Phase-I (1999-00-2004-05), while 92 percent growth in output was associated with 11 percent growth in employment for organized sector, it was only 17 percent growth in output which supported 8 percent net employment growth for unorganized sector. The trend slightly reversed in the Post Reform Phase-II (2004-05-2009-10) as we observe that around 68 percent incraese in net output of organized sector was associated with a decline in employment of around 55 percent whereas in unorganized sector 18 percent output growth was associated with 5 percent decline in employment. In Over All Phase (1999-00-2004-05), though in organised sector, net output growth (224 percent) was associated with net employment decline of 50 percent, but in unorganized sector, 39 percent net growth in output supported only 3 percent growth in employment.

The GDP and employment growth pattern as exhibited in Post Reform Phase-I (1999-00-2004-05) which, no doubt, captures the consequences of reform measures to some extent, is not so disappointing as we see growth in employment and output as compared to Post Reform Phase-II (2004-05-2009-10) where output growth is associated with decline in employment. As more and more time passes, liberalization gets deepen and possibly the reorientation of production structure reverses the trend, to some extent, in the post reform periods.

Decomposition Results

Now let us move to the decomposition results which are presented in table-4. As indicted in the table, in the Post Reform Phase-I (1999-00-2004-05) positive growth effect was strong enough in unorganized agriculture so that it alone cancelled out the impact of negative productivity change effect, negative structural change effect and negative cross effect to generate net growth in employment of significant size(21 million). In organized agriculture, it was the growth effect as well structural change effect which were responsible for employment growth of only one million. In the Post Reform Phase-II (2004-05-2009-10), net employment change was negative both in unorganized (-11 million) and organized (-3 million) agriculture. In the unorganized sector, it is mainly due to negative productivity change effect which has cancelled out the positive growth effect. In the organized sector, negative growth effect has cancelled out the positive productivity change effect. In the overall phase (1999-00-2009-10), the unorganized agriculture has registered net employment growth of 10 million and this has been made possible due to pure growth effect. The net employment change for organized sector is negative (-3 million) and the factor responsible for this decline in employment were negative structural change effect and interaction effect. So, it seems that the positive employment growth over the period 1999-00-2004-05 was due to positive pure growth effect whereas the decline in employment over the period 2004-05-2009-10 was due to negative productivity change effect.

Table 4: Component Forces of Employment Growth

	Productivity Change Effect	**Growth Effect**	**Structural Change Effect**	**Interaction Effect**	**Net Employment Change(In Million)**
Phase-I (1999-00-2004-05)					
Unorganised	(-)17	(+)47	(-)6	(-)3	(+)21
Organised	(-)2	(+)1	(+)4	(-)2	(+)1
Phase-II(2004-05-2009-10)					
Unorganised	(-)49	(+)54	(-)7	(-)9	(-)11
Organised	(+)10	(-)5	0	(-)8	(-3)
Phase-III(1999-00-2009-10)					
Unorganised	(-)59	(+)107	(-)15	(-)23	(+)10
Organised	(+)3	(+)3	(-)6	(-)2	(-)3

Source: Author's Own Calculation based on the Equation No. 1.

Conclusion

Besides understanding the trade-off between the output and employment growth in Indian agriculture, in this paper, we have used a decomposition framework to separate out the component forces operated in the inter temporal growth of employment into four components such as productivity change effect, structural change effect, growth effect and cross effect. As indicated earlier, the entire study period has been divided into three phases namely, Post-reform Phase-I (1999-00-2004-05), Post-reform Phase-II (2004-05-2009-10) and Overall Post-reform Phase-III (1999-00-2009-10). The major findings that we got from our study are as follows:

1. The empirical investigation of the tradeoff between the output and employment growth in Indian agriculture suggests that the growing output is not associated with matching employment growth especially in the post reform periods.
2. As far as the contributing factor to the net employment growth is concerned, we observed that, over the period 1999-00-2004-05, 'pure growth effect' was mainly responsible for the positive employment growth of unorganized agriculture whereas 'pure growth effect' coupled with 'structural change effect' contributed to the positive employment growth in organized sector. We find a reversal over the period 2004-05-2009-10, where the negative employment growth in unorganized sector and organized sector was due to negative productivity change effect and negative growth effect respectively.

It seems that slow employment generation in the post reform phases is not the result of deficiency of effective demand in the Keynesian sense but it may be the consequence of capital deepening labour saving production structure of the Indian agriculture. It seems that time has come to look beyond agriculture for rural employment and in this context the rural non-farm activities may deserve some reprioritization in our development thinking.

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