

**Inclusive Development:  
New Challenges and  
Opportunities**

**WORKING PAPER**

**Volume –VII**



# **Inclusive Development: New Challenges and Opportunities**

**Working Paper**

**Volume –VII**

**A.K.Dasgupta Centre for Planning and Development**  
[A Centre sponsored by the NITI AAYOG, Govt. of India]

**Visva-Bharati,  
Santiniketan**



**NEW DELHI PUBLISHERS**

New Delhi

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First Edition 2018  
ISBN:

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**New Delhi Publishers**

90, Sainik Vihar, Mohan Garden, New Delhi – 110 059

Tel: 011-23256188, 9953694312, 9582248909

[ndpublishers@rediffmail.com](mailto:ndpublishers@rediffmail.com)/[gmail.com](mailto:ndpublishers@gmail.com)

website:[www.ndpublisher.in](http://www.ndpublisher.in)

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## **Acknowledgement**

This book has been a collaborative effort between the A.K.Dasgupta Centre for Planning and Development and the authors of the paper based on the field studies conducted by them. I am grateful for their valuable inputs and co-operation. I am thankful to the Upacharya Prof. Swapan Kumar Datta and the Registrar of the University Prof. Amit Hazra for support and encouragement. I also acknowledge my debt to the different sections of Visva-Bharati for extending necessary help in carrying out activities. Acknowledgement will remain incomplete if special thanks is not given to Shri Daya Shankar Kushwaha, A.K.Dasgupta Centre for Planning and Development without whose untiring effort this book could be a reality.

**Pranab Kumar Chattopadhyay**

Chair Professor

A.K.Dasgupta Centre for Planning and Development

Visva-Bharati





# Awareness of Community Members and Other Stakeholders to Disaster and Disaster Preparedness: An Evaluative Study of Two GPs of Hingalganj Block, North 24 Paraganas, W.B

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## Abstract

*Strengthening Disaster Preparedness in Schools and Communities in Sundarbans is a project supported by Fondazione l'Albero della Vita (FADV) and implemented by Andrewspalli Centre for Integrated Development (ACID), Jogeshganj unit. The overall objective of the project is 'to reduce the vulnerability of children and other vulnerable groups including all community members by strengthening disaster preparedness at community and school level and by taking up mitigation measures with participation of children, community and other stakeholders'. Both qualitative and quantitative approaches were used for the study. Cluster random sampling techniques were used to select 120 households from the communities under the project areas and a pre-structured questionnaire was developed for the household survey. Focus Group Discussions (FGDs) were conducted with school children. Key and primary Informant Interview was conducted with community representatives and school teachers. The findings of the study are presented in the report: explores*

*and analyzes existing knowledge levels on disaster; focuses on practices and behaviors before, during and after disasters; and examines the coordination, service provisions and roles and responsibilities of different stakeholders. An analysis of findings from the household survey is presented and it was followed by the FGD findings. The present study will immensely help to researchers, students, NGO professionals and administrators working in the field of disaster management as the paper focuses a number of area to understand awareness level on DRR in two Gram Panchayats (GPs) in Hingalgañj Block.*

**Keyword:** ACID, FADV, DRR, CBDRR, Resilient, GP, etc.

## Introduction

Sundarbans covering Bangladesh and West Bengal is well-known for tiger reserve forest. The area is very prone to frequent flood and cyclone. The study is mainly covered 12 villages in two Gram Panchayats (GP) in Hingalgañj C.D. Block. Hingalgañj is an administrative Block under Basirhat subdivision of North 24 Parganas district in the state of West Bengal. There are three Police Stations which share their jurisdiction under Hingalgañj Community Development Block. They are Hingalgañj Police Station, Hasnabad & Hemnagar Coastal Police Station.<sup>4</sup> The main rivers cover in Hingalgañj Block are Roymongal, Icchamati, Dansha, Gourershar, Kalindi, Gomoti and Sahebkhali. There are flood shelters available in the whole C.D. Block, 4 community halls, 10 Higher Secondary schools, 15 Jr. High Schools, 128 primary schools, 48 SSKs, 4 MSKs, 327 ICDS Centres, one BPHC, 3 Primary Health Sub-Centres and 42 sub centers.<sup>5</sup> The whole C. D. Block and panchayats are covered with different islands. The Panchyats are divided into three different islands. The main islands consist of Hingalgañj & Sandelerbill GP, the others consist of Rupamari and Bishpur GP and rest five GPs constitute Dulduli, Sahebkhali, Jogeshganj, Gobindakati & Kalitala. The study concentrated in 12 villages of Jogeshganj and Kalitala GPs.

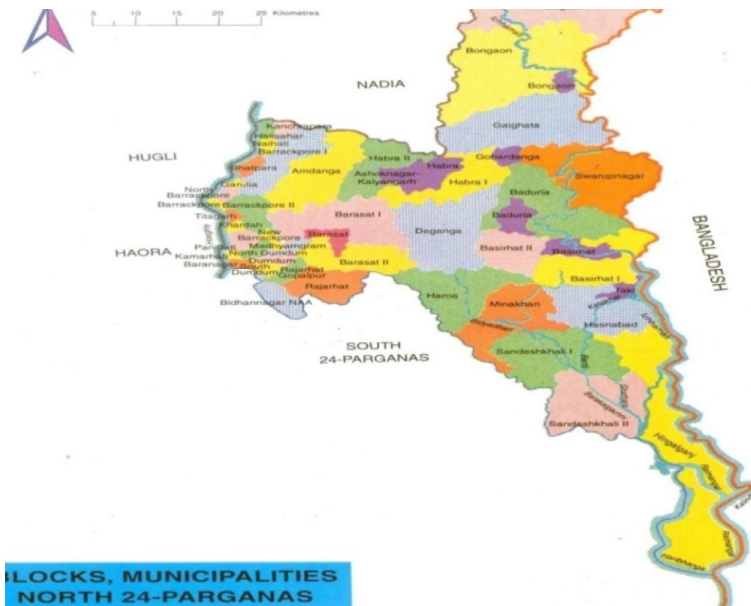
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<sup>4</sup><http://bdohingalgañj.org/index.php/about-hingalgañj>

<sup>5</sup>Ibid

### ***Disaster in Study Area***

Aila is a strong tropical cyclone causing damage in the area on May 25, 2009; it caused extensive damage in India and Bangladesh. As reported 330 people have been died in Aila, and at least 8,208 people were missing, while about one million people were homeless. Health officials in Bangladesh confirmed a deadly outbreak of diarrhea on 29 May, with more than 7,000 people being infected dying. In Bangladesh, an estimated 20 million people were at risk of post-disaster diseases due to Aila (NASA, 2009). Due to Aila heat in Sundarban Delta, specially Hingalganj lead to soil erosion, contaminated water



including drinking water, loss of community assets and degraded the environmental conditions in such a manner that it can lead to diarrhea, cholera, dysentery, typhoid, other diseases, influenza, loss of soil fertility due to saline water etc. (Pal, S; et al 2016). Study Area:

### ***Significance of the Study:***

The present study has a great significance because it is covering 12 villages in two panchayats--namely Jogeshganj and Kalitala as the areas are Aila affected areas and the soil erosion and salinity has made

the lives of the people very miserable there. As the Andrewspalli Centre for Integrated Development (ACID), a state level NGO with support from Fondazione l'Albero della Vita (FADV), an International nonprofit organization started implementing one Disaster Preparedness project entitled "Strengthening Disaster Preparedness in Schools and Communities in Sundarbans" from mid of July 2014, the suggestions of this study will help the organization very much. The organization is being implemented the project in two GPs of Hingalganj Blocks of North 24 Parganas where the area is vulnerable to flood almost every year and was highly affected as said by cyclone Aila in 2009. Children and community lack access to proper early warning, shelter, drinking water and sanitation facilities. The disaster management programme initiated by government and other agencies failed to take care of the needs of the children including, nutrition, education, psychosocial and protection issues. The children always remained as passive recipients of services. The research aims at finding awareness level in reducing the vulnerability of members of the area by strengthening disaster preparedness at community and school level and drawing areas to take up mitigation measures with participation of children, community and other stakeholders. So, it was necessary at the beginning stage to understand awareness level of the members residing in the area to strengthen Disaster Risk Reduction (DRR) measures at community level, taking up demonstration work for school safety programmes and building the capacity of stakeholders at different level and network and advocate for child focused DRR. The community based Disaster Risk Reduction (DRR) as initiated by ACID includes both software and hard ware activities. The software activities includes hazard, vulnerability and capacity assessment, contingency planning, strengthening early warning, formation and strengthening of task forces and building the capacity of staff and disaster management committee on DRR and child protection where as hardware activities includes study and demonstration of resilient livelihoods, mangrove plantation, improving water and sanitation facilities and small and medium mitigation measures. The school based DRR includes assessment school safety, formation and strengthening of disaster management committee and task forces, mitigation activities to demonstrate a model school with DRR measures. Children and community are at the centre of the programme to plan, execute and monitor the activities. So, this study will work as preliminary study to draw a map for implementing correct knowledge.

### ***Objective of the Study***

- The broad objective of this study is to assess the awareness, knowledge and practices (AKC) of schools and communities on project interventions in the target area right from the beginning of implementing this project.
- The Specific objective of the assessment are to assess the present working area and its characteristics (demography, occupation, communication and transportation, education, health and etc); to identify the present status of community and all other stakeholders in terms of their awareness and knowledge to prepare for and respond to any types of disasters and to identify the DRR initiatives of different stakeholders in working area in terms of policies, practices and actions and mechanisms of coordination between GO-NGO.

### **Methodology**

The baseline survey followed an exploratory research design with a combination of desk review of all relevant documents including project proposal and other publications that may be necessary for the assessment, secondary data from the government offices (including Gram Panchayat, Block and District Offices), Focus group discussion(s) with the partner and interview with the key informants and beneficiaries along with relevant stakeholders. It has given attention to collect primary data from key stakeholders through various consultative tools and processes.

The study used Household Survey as a tool of data collection. The survey frame followed a two-stage cluster random sampling to generate reliable estimate across project areas of Hingalgunj Block. FGD was conducted with children's group in the schools. Interview with some key informants like BDO, Panchayat Development Officer, Relief Officer, Gram Panchayat Pradhan, Gram Panchayat members of respective villages, Nirman Sahayak, one School Teacher from each School, 7 SHG leaders from the villages specifically engaged as MGNREGA supervisors.

To conduct data collection both household survey and FGD with different groups, a survey design questionnaire was prepared with

a FGD checklists focused on the areas such as general knowledge on DRR and climate change, such as understanding of hazards, risks and vulnerabilities, knowledge of early warning and awareness of changing patterns in climate and its impact on livelihoods. The survey was also design questionnaire related to community practices to DRR, such as mitigation measures (homestead raising, protecting water resources, safe storage of food, disaster resilient constructions, reforestation, etc), preventive activities at community-level, dissemination of early-warning, mock drill exercises and adjustment of livelihoods to changing climate patterns. Besides, the questionnaire was also designed on awareness of DRR-related services available on existence of resource people/groups on DRR, Shelter and NGOs.

More specifically, for each stakeholder interviewed the areas were considered on general knowledge on DRR and climate change, integration of DRR activities in operational documents and activities, etc. At school level ---teachers, School Managing Committee (SMC) and students were interviewed and assessed through FGDs on general knowledge on DRR and utilization/appropriateness of DRR curriculum, levels of involvement of schools in DRR.

## **Sampling**

Primary sampling units or clusters selected using probability proportion to size sampling (PPS) technique, where probabilities are proportional to number of population as villages have different size of population. In each cluster an equal no of households has been selected from house listing.

## **Determination of Sample Size**

1. We expect that prevalence rates to be 50% i.e. ( $P=0.5$ )
2. We want to be 95% confident of detecting a true proportion i.e. ( $Z_{0.05} = 1.96$ )
3. We want to measure this proportion with 10% precision/ coefficient of variation. i.e. ( $CV=0.1$ )

4. Assuming, intra-cluster correlation coefficient to be 0.005 i.e. ( $\rho=0.005$ )
5. If we want to select 40 clusters. ( $m=40$ )
6. Design Effect would be,  $deff= 1+(m-1)\rho = 1.2$
7. Assuming, attrition rate = 0.

Required sample size for estimation of proportion (n) is,

$$n = deff \times \frac{z_{0.05}^2 \times P(1-P)}{CV^2}$$

Substituting values we get  $n=115$ . This requires 3 respondents each from 40 clusters in 12 villages requires to be surveyed ( $40 \times 12 = 3 \times$ ) however, the attention is given to make the 10 villages into 40 clusters thereby resulting 120 respondents.

### **Defining Concepts:**

1. Disaster refers to a serious disruption of normal functioning of a community involving enormous losses which exceeds the ability of the affected community or society to cope up by using its own resources.
2. Disaster Risk Reduction (DRR) is a concept and practices that reduces disaster risks through efforts to overcome the causal factors of disasters, including wise management of the land and the environment. At the community level, preparedness can be improved through adopting appropriate technologies for safety, protection, safe storage facilities for seeds and harvest, livestock shelters and safe and hygienic food preparation practices, high raised water points etc, as a part of DRR.

### **Respondents according to village and panchayats:**

For the purpose of this study 12 following villages were selected (see table-1). Further 12 villages were divided into 40 clusters to pick up 120 respondents as under.

**Table 1: Number of Respondents selected vis-à-vis cluster formed**

GP	Village	No. of households	Total population	No. of Respondents	No. of clusters
Jogeshganj	Hemnangr Paschim Para	425	2700	12	4
	Hemnagar Purba Para	435	2980	12	4
	Jogeshganj Purba para	270	1731	9	3
	Jogeshganj Dakshin para	242	1548	9	3
	Madhabkati Dakshin para	405	2989	12	4
	Madhabkati Paschim para	512	4051	12	4
Kalitala	Haridas Kanti para	388	1389	9	3
	Dakshin Kalitala	272	1452	9	3
	Uttar Samser Nagar -1	188	927	9	3
	Uttar Samsher Nagar	206	986	9	3
	Dakshin Samser Nagar	310	1326	9	3
	Dakshin Samser Nagar – 1	233	1069	9	3
		3876	23146	120	

### Focus Group Discussion:

School wise FGDs were conducted in some schools available during the study period in the project area. *Participants for FGD were mainly the children (9-18 years of age) who take part in the process, contributing their opinions.* The size of group was between 10-12 children. The group was heterogonous with the representation of boys, girls, caste wise representation and participation of disabled children.



**Interview with the key informants:**

Key informants interview was conducted with the following persons-BDO, Panchayat Development Officer, Relief Officer, Gram Panchayat Pradhan, Gram Panchayat members of respective villages, Nirman Sahayak, 1 School Teacher from each School, 7 SHG leaders from the villages specifically engaged as MGNREGA supervisors.

**Field Operation of Baseline Survey:**

Data collection from the field was conducted over 20-day period between the July and August 2014. The Team Leader in the field was constantly on hand to provide clarification and instruction to the enumeration team on concepts, definitions and to resolve difficulties in carrying out the field work. To ensure the quality of the information collected, the team leader would provide refreshers in the field to the survey team and provide solutions to overcome daily challenges. The team leader and supervisors reviewed each and every filled-in questionnaire from the day's work. Each interview question was checked on a question by question basis and explanations sought for unclear information or errors. The team leader would optimise the team's potential through identifying the strengths and weaknesses of individuals within the team and pairing team members accordingly.

**Data Entry, Processing and Analysis:**

Each questionnaire was submitted systematically by division and by village. The survey data from each location, once edited and cleared, then submitted for the Data Entry. The findings from the survey were processed from excel spreadsheets.

**Limitations of the Study**

The baseline study has dealt with the knowledge and awareness of community members and other stake holders relating to disaster, climate change and adaptation issues using multiple methods among stakeholders that are subject to some limitations and constraints. It is neither possible nor expected that such a baseline study covers all issues relating to disaster, climate change and adaptation within the scope of the work of the study. The survey, although has covered a

significant number of stakeholders, there are some risks to generalize the survey results for all the stakeholders. There is a tendency among respondents to engage in guess work in giving answers with multiple options, which therefore may not reflect the actual knowledge level at least for some respondents. The number of female respondents was rather small under the survey.

The indicator values for the female respondents may therefore be subject to some biases and should be viewed with caution. Despite all these limitations, the study provides fairly acceptable and reliable information/findings towards achieving the study objectives.

## Major Findings and Analysis

### *The Average Size of the family:*

This sub-section describes the basic socio-economic characteristics of the respondents of the household survey. The average size of the respondent's household was 4.07 (See table-1).

**Table-I: Average no. of family members**

Table-1	
Sex	Average
Male	2.132231
Female	1.942149
Total	4.07438

### **Religion:**

99.16 % of the respondents were Hindu and only 0.84 percent of the respondents found from Muslim community (table-2).

Table-2: Religion		
Religion	No	%
Hindu	119	99.16
Islam	1	00.84
Total	120	100.00

### **Caste category:**

So far as caste category is concerned it is observed that 92.5% respondents belong to Scheduled Caste community, 1.66% from OBC com-

munity, 5 % from Scheduled Tribe community and 0.83 percent from General category (table-3).

**Table-3: Caste category of the SHG members**

<b>Caste category</b>	<b>No.</b>	<b>%</b>
Gen	1	0.83
OBC	2	1.66
SC	111	92.5
ST	6	5
<b>Total</b>	<b>120</b>	<b>99.99</b>

### **Education of the respondents:**

The level of education found within the surveyed population was relatively low with majority of the Of respondents attended up to primary and upper primary school level (56.16 %); only 10% of the respondents had attended up to secondary school level and above. A negligible percentage attended Higher Secondary and Graduation and above level, which constitute 03.33 % and 1.66% respectively.

**Table-4: Educational level of the respondents**

<b>Level of Education</b>	<b>No. of Respondents</b>	<b>%</b>
Illiterate	17	14.17
Primay	17	14.17
Upper Primary	68	56.67
Secondary	12	10.00
Higher Secondary	4	03.33
Graduate and Above	2	01.66
<b>Total</b>	<b>120</b>	<b>100.00</b>

### **Occupation of the head of the households:**

The analysis of the occupation of the household members provided an interesting insight. The highest percentage was composed of cultivation with 50.83 % with pretty agricultural activities. Daily laborers accounted 37.5 percent.

**Table-5: Occupation of the head of the households**

Occupation	No. of respondents	%
Business	2	1.67
Cultivation	61	50.83
Daily Labour	45	37.5
Fisherman	5	4.17
Para Teacher of Primary School	1	0.83
Migrated	5	4.17
Prist	1	0.83
<b>Total</b>	<b>120</b>	<b>100.00</b>

**Housing pattern:**

Only 6% of the households are living in Pucca houses. 45% households has ownership of land.

**Table-6: Housing pattern**

Type of house	No. of house	%
Pucca	7	2.6
Semi Pucca	58	48.34
Kaccha	55	48.84
<b>Total</b>	<b>120</b>	<b>99.99</b>

**Electricity:**

Is there any electricity in your house? 80 % respondents says 'yes', but still sizeable number of respondents says 'No', which is 20 % in the area and among the beneficiaries households.

**Table-7: Electricity connection**

No. of respondents says 'yes'	96	%
No. of respondent says 'No'	24	80
<b>Total</b>	<b>120</b>	<b>20</b>

Monthly Income: The households had an average expenditure of Rs. 5250 per month. Food and Clothing constituted majority of the monthly expenditure 48%. Education and Health Care constituted another 23% of the expenditure of the households.

**Table-10: Do you have capacity to manage 3 meals per day?**

No. of respondents says	Total	%
Yes	107	89.16
No	13	10.84

It is unfortunate that there are people in this area who could not manage 3 meals a day and their percentage is 10.84, rest can manage in this area to get 3 square meals a day.

### Knowledge levels on DRR

Different sources of knowledge are laid out with a strong emphasis on empirically-gained knowledge. The table-11 presents the different types of hazards as identified most common in the area by 120 respondents. River Erosion, Tidal surge and salinity of ground water are common hazard identified by the households followed by Cyclone /Tornado and flood with 80.0% and 87 % of respondents. Some respondents expressed that earthquake (58.0%) and Fire (27%) were also areas of concern where study should be carried out further. But 100% respondent reported the knowledge of salinity and river erosion. It is important to note that all the respondents surveyed expressed their opinions on this particular question.

**Table-11: Knowledge on different types of hazards**

Type of hazards	No. of respondents says 'yes'	%
Flood	96	80.0
Tornado	105	87.5
Earth Quake	70	58.3
River Erosion	120	100.0
Fire	32	26.7
Cyclone	96	80.0
Tidal Surge	97	80.8
Water Logging	81	67.5
Salinity	120	100.0
Do not know	4	3.3

In FGDs participants expressed similar opinions to those of the respondents of the household survey emphasizing tidal surges and

cyclones as the most common types of hazards but more elaborate answers came from the FGDs. Hence, the Key Informants said that cyclone, flood, drought, excessive rainfall, river erosion, and earthquake were potential hazards for their areas. School teachers, students and SMC members added inflow of saline water to the list of hazards affecting their community.

### **Kind of problems faced due to disaster:**

The kind of problem they encounter during disaster as they reported are food crisis, living problem, cooking problems, unemployment, toilet, safe drinking water, communication problem, stopped children's education, deaths of animals, loss of life etc. ( See Table-12).

**Table-12: Type of problems faced by the community members (multiple answers)**

<b>Type of problems</b>	<b>No. of respondents says 'Yes'</b>	<b>%</b>
Food crisis	115	95.8
Living problem	116	96.7
Cooking problem	120	100.0
Unemployment	98	81.7
Toilet problem	119	99.2
Communication problem	113	94.2
Safe drinking water	120	100.0
Increase diseases	111	92.5
Increase diseases of children	104	86.7
Stop education of children	105	87.5
Increase possibilities of death	89	74.2
Increase possibilities of death of animal	92	76.7
Loss of life	90	75.0
Loss of animal life	101	84.2
Damage of crops	103	85.8

### **Awareness on precautionary measures:**

As a precautionary measure respondents mostly recognized keeping children, persons with disabilities and older people in safe place and

keep ready dry food. Keeping portable stove, candles and match, important documents such as certificates and dry foods have also been prioritized by the respondents. The details of the responses as precautionary measures are presented below (see table-13).

**Table-13: Precautionary measures realized by respondents (multiple responses)**

Type of measures	No. of respondents	%
Raise the house	83	69.2
Raise the latrine	82	68.3
Lift up the tube well pump	63	52.5
Keep activate the safe water source	84	70.0
Keep ready dry food	112	93.3
Keep ready portable/mobile cooking stove	103	85.8
Keep ready candlesticks and matches	101	84.2
Keep ready banana tree fleet	95	79.2
Keep necessary papers wrapped in plastic	99	82.5
Keep ready first aid box	75	62.5
Keep children, person with disability and older people in safe place	113	94.2
Keep ready Equipments for making platform(mancha)	90	75.0

In convergence with the findings from the household survey, the Key informants as well as the school children expressed in the FGD session that people living on the river banks particularly outside of the embankment, fishermen, children, elderly, people with disabilities and the poor people were the most vulnerable to risk.

The FGD participants of schools (teachers, students) specifically mentioned some important factors behind this increased vulnerability.

These were as follows:

- Lack of awareness;
- Inadequate number of volunteers;
- Fishermen do not get warning signals in time;
- The meaning of warning signals is not properly understood or followed by the community;
- Absence of or improper or inadequate or unplanned embankment.
- Lack of maintenance and reconstruction of embankment;
- The women, elderly people, fishermen, children, persons with disabilities, cannot move to shelters immediately.

### **Preparedness measures needed:**

It is very clear from the data that the respondents given their choice for kind of measures needed during disaster. They had given preference the measures like to take shelter at safe place (88.3%) which at present lacking in the area, raised toilets to use during hazardous periods (78.3%), eat dry food (94.2%), need to use banana tree raft fleet for movement, safe drinking water (80.8%) and regular washing of hands (80.8 percent)the views given.

**Table-14: Kind of preparedness measures needed during disaster (multiple answers)**

Kind of measues needed	No. of respondents	%
Need to take shelter at safe place	106	88.3
Raised the toilet	94	78.3
Eat dry food	113	94.2
Need to use banana tree raft fleet for movement	103	85.8
Portable cooking stove	104	86.7
Need to use safe water for drinking and other domestic purpose	97	80.8
Regular washing of hands before eating and after defecation	89	74.2

### **Knowledge on early warning:**

Regarding the overall understanding of the early warning system 66% of the respondents receive advance forecast or early warning signal before disaster.



**Table 15: Did you receive early warning before disaster (Aila)**

Opinion on early warning	No. of respondents	%
No. of respondent says 'Yes'	90	75
No. of respondents says 'No'	30	25
Total	120	100

80 % of respondents revealed that they get early warning signals primarily through TV and Radio (Table-16). Role of Village development committee and other community based committees found to be limited in this respect.

**Table 16: Sources of early warning signal**

Sources of early warning	No. of respondents	%
Village development committee	20	16.66
Member of village disaster management committee	4	3.3
Member of village education management committee	23	19.2
Radio/ Television	96	80.0
Newspaper	40	33.3
Mobile phone	27	22.5
Others (NGO/Vounteers)	10	8.33

### **Institutional knowledge on DRR:**

The main sources of institutional knowledge on DRR include training from various governmental and non-governmental organizations for different community stakeholders on disaster-related issues, the community risk assessment process. A number of respondents about 100 (83,33%) had never received any training on DRR and did not know about any organization that works on disaster risk reduction in their locality. However, the respondents emphasized that they gained some knowledge on disaster issues through the media, namely newspaper, radio and television.

FGD participants had relatively been involved in more training opportunities even though that varied significantly from one institution to the other. PRI members had never received any training on DRR as an institution and only few members had received a relevant training

but as holder of another responsibility. Most teachers also declared having never participated in training on disaster-related topics. Only a few key informants declared having been involved in training courses facilitated by various NGOs on disaster management. All the participants in the FGD, including school teachers, expressed a strong interest in receiving training on disaster-related issues.

### **Risk Assessment Process**

School children and Key informants declared having never been involved in risk mapping exercises and not being aware of the existence of a village profile in risk. Though some key informants declared having been involved in Community Risk Assessment exercises but they neither shared the outcomes of such exercises with community members nor did they share with schools.

**Table-17: Information on risk mapping exercises**

Indicators	No. of respondents said "yes"	%
Disaster risks assessment conducted in your locality	12	10.0
If yes, did you or your family members involve with the risk assessment process	5	4.2
Did you or your family members see the disaster risk map that visualized in your community	1	0.8
If yes, was that putted in the right place?	1	0.8
Is there any community action plan (Disaster Risk Reduction Plan) available to mitigate the disaster risks?	0	0.0

### **Major activities performed by the people**

Though the Disaster Management Committee (DMC) is yet to be constituted in the villages, the different stakeholders like PRI members and employees, teachers, people are engaged in activities related to disaster risk reduction and community has knowledge on DRR activities. 80% of them have participated in relief work, 69% of the respondents have participated in protection of dams.

**Table-18: Major activities of the stakeholders in the locality**

<b>What kinds of major activities perform by different stakeholders in your locality for DRR</b>		
Relief	97	80.8
Rehabilitation	54	45.0
Training	42	35.0
Early signal delivery	54	45.0
Awareness raising	53	44.2
House construction	61	50.8
Dam construction	83	69.2
Medical Treatment	46	38.3
*Other, explain	9	7.5

**Suggestions:**

1. Early warning systems should be utilized more efficiently and the stakeholders need to have a proper procedure like siren that they can follow in case of emergency.
2. Pamphlets, workshops/ training sessions, door to door knowledge dissemination systems etc can all help towards increasing takeholder's knowledge about disaster and disaster risk management.
3. Training programmes should be designed to evaluate the performance of the group as well as the individual members of Disaster Management Committees (DMCs). This is particularly important in the context of wide knowledge gap among the DMC members as highlighted through the study.
4. It may be noted that the DMC members should include all stakeholders in disaster management programme. After training of DMC members, the capacity and information gained needs to be shared with larger community.
5. People at community level, particularly in PRIs, should be well aware about human induced hazards. The training programme is necessary to create awareness and build-up capacity of the stakeholders to reduce risk of human induced hazards.
6. More extensive awareness and training progammme may be organized at three tier PRI level immediately to equip the DMC members

on knowledge regarding climate change issues in order to reduce adverse impacts and adaptation to climate change issues.

7. Likewise training programme may be conducted to increase awareness on the existing disaster risk management strategy of the government and build up capacity of DMC members at every level.
8. The functions/ activities of the DMCs should be properly monitored by the appropriate agency and each member of the DMCs should be well informed periodically about their roles and responsibilities during normal and disaster periods.
9. Continuity of membership in DMCs especially at the PRI levels should be ensured so that acquired knowledge and capabilities are properly utilized.

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# Facing the challenges of womens empowerment in the South 24 Paraganas

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Women's' empowerment is a burning global concern. Numerous ways and means have been developed to cope with the challenge. In rural West Bengal the issue presents diverse dimensions and dealing with it demands collaboration between the Government and non-governmental organizations. Empowerment is a multi-dimensional concept and may be addressed from different angles. Present study will address selected application of the concept among the rural agricultural women of the district whose involvement and physical labour in the agricultural production remained unrecognized since decades. It is also a known fact that malnutrition and lesser consumption of food are serious impediments to their healthy development. Apart from conventional means of women's' empowerment if these aspects can be added to the agenda greater section of women may be benefitted.

The rural women of the South 24 Paraganas face numerous challenges of livelihood. Superstitions, diseases, natural disasters, covetous human factors are some of the impediments. The materials collected through field studies convinced how local non-governmental organizations adopted a combined project for developing agricultural entrepreneurship among women farmers and took a keen look to care for their healthy well-being and social awareness.

The source materials of the study are documents supplied by the selected organizations, study reports, field visits and secondary writings. A close look at the activities of the Piyali Learning Centre

(PLC) convinces one how the challenge of the trafficking of women led the founders of the school to prevent the menace with the tool of education. With the co-operation of the local people the centre was founded with a determination to ensure a better livelihood to the girls and their mothers. In effect the families are benefitted as a whole.

Another institute in our study is Neempith Ramakrishna Mission. Along with regular social service on the footsteps of Swami Vivekananda the institute has arranged for agricultural research and organize workshops for the agricultural milieu. A remarkable aspect of the activities is training for the women farmers. Arrangements are made for developing their awareness in cooking nutritious food, developing healthy practices, growing kitchen gardens, eradication of superstitions and thereby ensuring a better lifestyle for them.

The study project aims to look at the process of development among the women living in remote villages amidst the clutch of superstitions and backward social norms and to study the feasibility of applying the model in other context too. The present district of South 24 Paraganas with its unique geographical and human variations presents a combination of multi-layered challenges and opportunities. The boundary of the district is as follows :- the Bay of Bengal in the South, Bangladesh in the East, Howrah and East Medinipur in the West and Kolkata and North 24 Paraganas in the North east and North west respectively.

Historically the area under discussion came under the sway of historical process since ancient period. Apart from the Archaeological findings the area was mentioned in the Greek travel literature as the Gangaridae inhabited by the Ganga people. It seems that, a prosperous civilization based on trade and commerce flourished there. Tamralipta was the chief port for sea-borne trade. Fa-Hien, Hiuen-tsang and other Chinese pilgrim-travellers referred to the brisk trading activities of the port. The Imperial Guptas extended their political suzerainty over this remote corner of Bengal (Vanga). Archaeological findings comprised of terracotta figures of the Brahmanic deities, coins point to the Gupta influence. Then the region came under the local rulers who were nevertheless powerful enough. The Pala rulers of Bengal were challenged by the Chandras, a local dynasty. A huge temple, known as Jatar Deul built by some local ruler still exists. They contributed to the development of a rich cultural

heritage in the region. Sri Chaianya and his Gaudiya Vaishnavism were another driving force to initiate a Vaishnavite cultural tradition. During the Mughal rule Pratapaditya, one of the turbulent among the Baro Bhuinas ruled over there. With the advent of the Portuguese the political equation altered. The Bhuinas managed to get their military help in their anti-Mughal struggle and the Portuguese in their turn looted the innocent villages unabated. As a result several villages became desolate. During the late Medieval period the region was under the administrative jurisdiction of the Nawabs of Bengal. Following a treaty between Mir Zafar - the Nawab of Bengal and the English East India Company (1757) the district passed under the jurisdiction of the Company. During that period it was bordered by the Bhagirathi channel in the West, Eastern Bengal in the East, the district of Nadia in the North and the Bay of Bengal in the South. During the Colonial period the region became the nurturing ground of anti-establishment peasant uprisings stretching upto the Independence and after leading to the Land Reforms during the Leftist rule. Political ups and downs, confrontation with the covetous zamindars, rigours of the life within the dense forest, natural disasters led to the development of unique characteristics of the region being superb self-confidence, tenacity, strength of mind and religious tolerance though economic deprivation, lack of employment, low level of education, lack of general awareness and related problems are some of the obstacles in the way of development.

#### **South 24 Paraganas (census 2011)**

	2011	2001
Actual Population -	8,161,961	6,906,689
Male	4,173,778	3,564,993
Female	3,988,183	3,341,696
Population growth	18.17%	20.85%
Sex Ratio(per 1000)	956	937
Child sex ratio (0-6 years)	963	964
Average literacy	77.51	69.45
Male literacy	83.35	79.19
Female literacy	71.40	59.01

The rate of crime against women is very high in the District.

**Total number of IPC CAW Cases 2000 & 2003(Source HDR SOUTH 24 PGNS, 2009)**

District	2000	2003
Bankura	194	264
Birbhum	353	367
Bardhaman	727	739
Coochbihar	336	369
Darjeeling	133	146
Hoogly	583	567
Howrah	267	237
Jalpaiguri	297	376
Paschim Medinipur	904	530
Purba Medinipur	N.A.	402
Murshidabad	440	814
Malda	213	275
Nadia	595	600
24 Paraganas North	843	1128
24 Paraganas South	975	1214
Purulia	259	187
Uttar Dinajpur	225	170
Dakshin Dinajpur	242	227
Kolkata	602	679
Total	8188	9551

**Source:** HDR South 24Pgns,2009

According to the Indian Penal Code crimes against women may be as follows:-  
Rape,(Section 376IPC)

Kidnapping & Abduction for different purposes (Section 363-373IPC)

Homicide for dowry, dowry deaths and their attempts(Section 302/304B IPC)

Torture or cruelty both physical& mental(Section 498A IPC)

Molestation (Section 354IPC)

Sexual harassment or Eve-teasing(Section 509 or 294IPC)

Importation of girls upto 21 years of age (Section 366 B IPC)



In a well-researched article the vulnerability of the women of the district under discussion was highlighted. Sharing of some crucial observations may be pertinent. In the HDR South 24 Paraganas, 2009 a Report titled 'District wise incidents of crime against women (CAW) in West Bengal in 2003 & 2009' the total number of IPC CAW cases in South 24 Paraganas were 975 in 2000 and 1214 in 2003 in comparison to 843 in 2000 and 1128 in 2003 of North 24 Paraganas. The number represented the highest rate of reported crime against women and it goes without saying that in our society crime against women remains unreported in most cases. The list of crimes against women include rape, molestation, kidnapping, abduction, murder, (including dowry death), sexual harassment, physical and mental torture, cruelty and trafficking. Rural 24 Paraganas presents the picture of 65.49% married girls in the age group of 10-14. Particularly the economically weaker milieu are the worst sufferers especially women and children are the target. West Bengal stands on the top of trafficking on women and South 24 Paraganas is one among the top three districts. The activities of the Institutes we are going to discuss are located in the Canning I and and Joynagar II blocks respectively. Glimpse over the census data of the blocks presents the following features:-

**Block: Canning I (Census 2011)-Population –304724 (51% Male,49% Female)(SC: 144906)(ST: 3,710)**

Urban	-- 123,216
Rural	-- 181,508
Literacy	-- 70.76% (56%Male,44% Female)
Hindu	-- 61.9%
Muslim	-- 37.49%
Others	-- 0.54%

In view of more than 85% rural population the standard of living ranks the block 16 among all the 29 blocks. Infrastructural development ranks 21.Only 13.80% household have Electricity, length of surfaced road 0.78 per km<sup>2</sup> area, number of bank branches 0.29 per 10000 population. Lack of access to irrigation is a major problem in agriculture though the scope of employment are limited beyond agriculture.49.93%of rural household are engaged as daily agricultural or other physical labour intensive job,19.7%as cultivators,10.58% self-employed rural

artisans /hawkers.7.93% work in labour-oriented regular jobs in unorganized sector and 11.85% work in the unorganized sector or work as professionals.

**Block Jaynagar II Population --252,164(51% Male,49% Female)  
(SC 85,587,ST 1,046)**

Urban	-- 12,380
Rural	-- 239784
Literacy	-- 69.71%
Male	-- 57%
Female	-- 43%
Hindu	-- 47.03%
Muslim	-- 52.23%
Others	-- 0.74%

The blocks belong to Region II are being classified as underdeveloped regions. Level of education, employment, health of women are lagging behind and as a natural corollary early marriage as a possible solution of relief against all sorts of insecurity has become rampant. Otherwise the women are sent as domestic helpers for earning . In most of the cases all these devices lead to either trafficking or dowry death of the women. In fact enactments against the mal- practices are plenty in number however awareness is negligible. The literary figures for the blocks and municipalities show that, women are lagging behind and female literacy rate is less than 50%. These blocks need gender-targeted policies of education. Numerous schools operate in comparatively well connected areas yet daily commutation from remote villages especially for a girl remains impossible because poor families are usually not prepared to spend for the education of a girl child. The rate of enrolment of girl children in the primary schools are better than the number of high schools which indicates the high rate of drop-outs of the girls. Many schools suffer from lack of drinking water and hygienic sanitation. All the factors lead to widespread illiteracy ,early marriage or trafficking of the girl child . They ‘miss the privilege of higher education and silently vanish from the system’. In fact such an episode of selling of a seven years old girl for Rs.40 by her father led the founder of the Piyali Learning

Center (PLC) to start the learning center in a small room with 25 girls. The school was founded in 2003 amidst the village of Piyali near Gaurdaha Halt station. It is a fully equipped and environmentally sustainable school for more than 200 girls. They learn State-approved academic syllabus ranging from Nursery to class XII. They are fully equipped for a sound educational and moral development. They get books, uniform and other necessities, medical care, hygiene kit, breakfast, lunch and skill-development training. The girls also learn computer training ,physical education and cultural courses. Some girls face danger in their home of being abused or trafficked. SAFE is a project to provide for their safe on-campus boarding to enable them to complete their education. Their meal is cooked in the most hygienic manner. One Computer is allotted for each student . Student-teacher ratio is taken care of and the number of students per class cannot exceed 25. Apart from providing regular education the PLC has arranged for skill development training for the women especially the mothers of the students. They are trained in different self-earning courses namely, sewing, tailoring, organic gardening, jewellery making. The uniforms of the students are stitched by them. An adult literacy programme, known as Shakti teaches them to read, write and learn simple accounting skills. They also receive training in health and hygiene, nutrition and safety. As a result PLC has instilled a confidence among local women to take decisions and infuse awareness among other women of the rural communities. The money they earn from the sale of the jewellery products is invested in the training and they save some part for themselves. In collaboration with Rotary Club and PACE the organization has extended projects for public welfare in the village and dug 35 wells, set up 250 sanitation units, planted 10,000 trees and built roads. The PLC has changed the face of the area by way of infusing new blood, nurturing a new generation of educated, self-confident girls most of whom have thrown away the time-old drudgery of working as domestic servants and facing sexual harassments or being trafficked away to some brothel and materialized the dream of it's founder to make the organization a global 'model' for poverty eradication.

Geographically the District comprises of 9% of the total landmass of West Bengal. Experts have divided the District into two regions, namely, the marine-riverine delta (northern part) and the marine delta

zone (southern part). Saline water is a stumbling block for flourishing agriculture and the problem has mounted following the Aila. The sources of non-saline water are expensive and difficult to procure for the agriculturist BPL milieu. In the northern part food crops are grown in alluvial soil while salt-resistant crops grow in the southern part. In 1999 the SGSY was introduced for the BPL people yet the weaker groups and the STs received relatively lesser coverage under the scheme of self-employment and hence their vulnerability has increased.

Development of women's capacity as successful farmers is a remarkable achievement of the Ramakrishna Ashram Krishi Vigyan Kendra (RAKVK), Sri Ramakrishna Ashram (f.1960-61), Neempith, Block Jaynagar II. located in a remote corner of the District they have made a detailed study of the potentialities of the local women and implemented a successful course of action for their development. The Ashram is following the directives of Swami Vivekananda that, "Our mission is for the destitute, the poor and the illiterate peasantry ... and the labouring communities" ... Severe poverty, challenging climate, clutch of superstitions, illiteracy, lack of technical knowledge, unemployment, unhygienic living condition, human trafficking are some of the features of the Sundarbans. The Ashram started its activities with the spread of education to be followed by a course of projects aiming at betterment of the socio-economic condition of the area. With the foundation of the RAKVK (f.1979) assisted by the ICAR, Ministry of Agriculture, Government of India measures were taken for multi-disciplinary activities for the farmers. Gradually the women farmers were also brought into the orbit of the programme since it was realized that, they play active role in agriculture and after training are expected to be proficient in agricultural activities. The RAKVK has implemented a project entitled, "Promotion of nutrition and medicinal garden aiming towards food and health security of backward womenfolk of the Sundarbans and emphasis on economic empowerment with financial assistance from Sundarban Development Board, Government of West Bengal," Formulation of low cost nutritious food and ensuring nutritional and economic security "is the objective of the Project entitled "Improvement of Nutritional status of women, children and adolescent girls in Sundarbans." The Rural Development Department, Sri Ramakrishna

Mission ,Nimpeeth has published several excellent coloured booklets especially for the adolescent girls , nutritious local food, recipes, the rights of the mother and the child etc. for the spread of awareness . The RAKVK has taken the following steps for women empowerment:-

Gender disintegrated activity analysis

Gender analysis regarding control and access to resources

Identification of technological gap and the area of less access and control

Participatory programme planning

Capacity building considering gender issues for technological empowerment

Establishing linkage with agencies for marketing of products

Linkages with allied sector (s) or project(s) aiming to social and psychological empowerment”

Field studies by the RAKVK experts and in-depth analysis of the data led to the formulation of an extensive project for the women which in turn benefitted the society. They used PRA tools like well-being ranking, gender analysis on activity, access and control of resources ,focus group discussion, problem-cause diagram ,matrix ranking and seasonality analysis. Besides, nutritional and stress assessment were also done to identify intervention points for nutritional security and for drudgery reduction”. The farmers received technical training in cotton cultivation, ornamental fish and bird rearing, nutritional security, value addition to food items, drudgery reduction etc.

The RAKVK had to face severe challenge of taboo severely affecting food habit of the pregnant women and children. As an appropriate optional measure they demonstrated nutrient rich food for the mother and child. As a result the health status of mothers improved. Training of the technical know-how of value addition nof surplus production of vegetables ,preparation of vegetable-based food staff and marketing of the products by the SHGs was another component of capacity –building. ‘Gender-friendly-equipments for the women farmers were introduced and they were trained to use the drudgery reduction technologies’.

There was a substantial increase in the number of woman participants in the workshops organized by the organization. As per the data of 1997-2002 the participation of women was 28%. It was increased in 2003-8 to 47% and goes without say that, the scheme was popularized and subsequent years witnessed more increase in the number of woman participants.

The spectacular role played by the RAKVK in the economic empowerment of the rural women may be explained from sharing the observations of the expert hailing from the organization --- "...rural women hesitate to take up any enterprise ...due to lack of confidence, insufficient fund to start any enterprise and lack of institutional support. To address the problem importance was given to organize the women and build a platform where regular interaction might revamp their thinking and motivate their self-help spirit". Organization of groups, skill development to run some occupation, capacity building to take decisions and shoulder responsibilities were the crucial areas where RAKVK intervened. The process of intervention is explained in the following points:-

Motivation for group formation

Linking with NGO for group formation

Skill training for every member of the group

Strengthening of SHG

Linkage with banks, other like departments and market

The role was primarily of 'facilitation for development'. 'Link with the bank, panchayats, etc. were established for maintaining their economic security. Availability of local resources, people's acceptance and participation, market demand, technical expertise were sources of strength of the entire development project. The share of women in the total family income amounted to 12-33% after intervention of the RAKVK. Economic empowerment of women facilitates the social and psychological empowerment. At present they have acquired the position of decision-making in the home and outside too. A notable change in their livelihood is worth mentioning. Their main livelihood options were prawn seed catching (18%), domestic helper (11%), and fire-wood collection (10%) and normal household works (41%). They and most of the male members were forced to migrate in search

of livelihood. After the intervention of the RAKVK though in a limited area a remarkable change points to the lowering of the rate of migration since both men and women work in their localities and earn livelihood along with smooth running of their families. Definitely this facts point to a qualitative change of the socio-economic change in the area under discussion.

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# Crop Diversification through Cultivation of Broccoli: A Successful Intervention by the Rathindra KVK, Birbhum for Nutritional and Economic Security of the Farmers

Dr. Prabuddha Ray\* and Dr. Dulal Chandra Manna\*\*

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*Broccoli is a high valued vegetable than Cauliflower. It has more vitamins and minerals than Cauliflower. Broccoli is more profitable crop than cauliflower. This has very good export potential after fulfilling internal market. Considering these aspects, the Rathindra KVK is now trying to popularize the cultivation of Broccoli as diversified, high value, low volume vegetable having a great bio-physical and situational potential to be established as one of the main growing vegetables of Birbhum District. The efforts of the Rathindra KVK till date show encouraging results from the On Station Trials, On Farm Trials and Front Line Demonstrations, it has conducted. This is corroborated by the fact that it has achieved an average B:C Ratio of 0.95 from the Front Line Demonstrations it has conducted over and above the average B:C Ratio of 0.69 to 0.71 from the cultivation of Cauliflower.*

**Keywords:** Broccoli, Cauliflower, B:C Ratio.

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Broccoli (from the Italian plural of broccolo, referring to “the flowering top of a cabbage”) is a plant of the mustard/cabbage family Brassicaceae (formerly Cruciferae). It is classified in the Italica cultivar group of the species Brassica oleracea. Broccoli has large flower heads, usually green in colour, arranged in a tree-like fashion on branches sprouting from a thick, edible stalk. The mass of flower heads is surrounded by leaves. Many varieties of broccoli are perennial. Broccoli most closely resembles cauliflower, which is a different cultivar group of the same species.

Broccoli is usually boiled or steamed, but may be eaten raw and has become popular as a raw vegetable in trays. Although boiling has been shown to reduce the levels of suspected anti-cancer compounds in broccoli, other preparation methods such as steaming, microwaving, lactic fermentation, and stir-frying have not been shown to reduce the presence of these compounds. Broccoli is a hardy vegetable of the cabbage family that is high in vitamins A and D. It develops best during cool seasons of the year.

Broccoli is one of the most promising vegetable both from nutritional perspective as well as economic considerations for introduction in the Birbhum District. Broccoli is a high valued vegetable than Cauliflower. It has more vitamins and minerals than Cauliflower. Broccoli is more profitable crop than cauliflower. This has very good export potential after fulfilling internal market. Considering these aspects, the Rathindra KVK is now trying to popularize the cultivation of Broccoli as diversified, high value, low volume vegetable having a great bio-physical and situational potential to be established as one of the main growing vegetables of Birbhum District.

**Broccoli, raw Nutrition Facts** \* Percent Daily Values are based on a 2,000 calorie diet and presented in the parentheses.

Serving Size is 1/2 cup (82g) and Servings per Container is 1 in number. Nutritional Ingredient Amount per Serving (% Daily Value\*) is depicted hereunder.

Calories 25; Total Fat 0g (0 %); Cholesterol 0mg (0 %); Sodium 20mg (1 %); Total Carbohydrate 4g (1 %); Protein 2g; Saturated Fat

0g (0 %); Dietary Fiber 2g (8 %); Sugars 1g; Vitamin A 20%; Vitamin C 50%; Calcium 2%; Iron 2%.

Source: - United States Department of Agriculture (USDA)

Web Site Source: - <http://www.fns.usda.gov/sites/default/files/NutritionLabels.pdf>

## **Nutritional and Medicinal Facts about Broccoli**

Broccoli, raw (edible parts), 100 g Nutritional value per 100 g (3.5 oz)

Energy	141 kJ (34 kcal)
Carbohydrates	6.64 g
Sugars	1.7 g
Dietary fiber	2.6 g
Fat	0.37 g
Protein	2.82 g
Water	89.30 g
Vitamin A equiv	.31 µg (3%)
Beta-carotene	361 µg (3%)
Lutein and Zeaxanthin	1121 µg
Thiamine (Vit. B1)	0.071 mg (5%)
Riboflavin (Vit. B2)	0.117 mg (8%)
Niacin (Vit. B3)	0.639 mg (4%)
Pantothenic acid (B5)	0.573 mg (11%)
Vitamin B	60.175 mg (13%)
Folate (Vit. B9)	63 µg (16%)
Vitamin C	89.2 mg (149%)
Calcium	47 mg (5%)
Iron	0.73 mg (6%)
Magnesium	21 mg (6%)
Phosphorus	66 mg (9%)
Potassium	316 mg (7%)
Zinc	0.41 mg (4%)

Broccoli is high in vitamins C, K, and A, as well as dietary fiber; it also contains multiple nutrients with potent anti-cancer proper-

ties, such as diindolylmethane and small amounts of selenium. A single serving provides more than 30 mg of Vitamin C and a half-cup provides 52 mg of Vitamin C. The 3,3'-Diindolylmethane found in broccoli is a potent modulator of the innate immune response system with anti-viral, anti-bacterial and anti-cancer activity.

Broccoli also contains the compound glucoraphanin, which can be processed into an anti-cancer compound sulforaphane, though the benefits of broccoli are greatly reduced if the vegetable is boiled more than ten minutes. A high intake of broccoli has been found to reduce the risk of aggressive prostate cancer. Broccoli consumption has also been shown to be beneficial in the prevention of heart disease.

### **Market Price Considerations**

Broccoli also fetches a very good market price in comparison to Cauliflower. It generally fetches average Rs. 120 kilo gram in the start of the season and at the high of the season it attracts a minimum average of Rs. 50 per kilo gram on an all Indian context.

In Birbhum situation when the Cauliflower is being sold at a rate of Rs. 30 to Rs. 40 per piece at the start of the Winter Season i.e. end of September and October months in preparatory phase of the Bengali festive seasons which gradually comes down to Rs. 8 to Rs. 15 per piece at the end of the season i.e. February or March months, the market price of Broccoli is around Rs. 50 to Rs. 60 per piece at the start of the season which gradually comes down to Rs. 15 to Rs. 25 per piece at end of the season i.e. February and March. This clearly shows that there is on an average two times more positive profit margin from the sales of Broccoli over per piece sales of Cauliflower throughout the winter season.

### **Technology Intervention from Rathindra KVK for Broccoli Cultivation vis-à-vis Cauliflower Cultivation**

<b>Cauliflower</b>	<b>Broccoli</b>
<b>Land Selection:</b> Well drained light Soil	Land Selection: Well drained light Soil
<b>Climate:</b> Temperature ranges from 15 – 28 Degree Centigrade	Climate: Temperature ranges from 15 - 28 Degree Centigrade
<b>Soils:</b> Loamy Soil, Sandy loam	Soils: Loamy Soil, Sandy loam

<b>Spacing:</b> 2.0 x 2.0 feet	Spacing: 2.0 x 2.0 feet
<b>Time of Planting</b> - August – October	Time of Planting - August – October
<b>Seed Treatment</b> –Treated with 2 - 2.5 gm Thiram / litre	Seed Treatment – Treated with 2 - 2.5 gm Thiram / litre.
<b>Application of Manure per hectare</b> – Compost- 20-25 ton; 190 (100 + 90) kg Urea; 400 kg SSP; 200 kg MoP	Application of Manure per hectare – Compost- 20-25 ton; 160 (100 + 60) kg Urea; 550 kg SSP; 170 kg MoP
<b>Application of Micro-nutrients</b> - 1-1.5 kg Molybdenum and 20 kg. Sodium borate per hectare before planting	Application of Micro-nutrients- 1 - 1.5 kg Molybdenum and 20 kg. Sodium borate per hectare before planting
<b>Yield</b> - 120-150 quintals per hectare	Yield - 100 - 140 quintals per hectare

## **The Rathindra KVK Initiatives for Introduction of Broccoli**

### **A. Technology Assessment**

- i. On Station Trial in the Rathindra KVK Farm  
The cultivation practice of Broccoli was first tested through On Station Trial (OST) in the Rathindra KVK farm in the Year 2009 – 2010. The results were encouraging. So, it was decided to go for On Farm Trials (OFTs) in the farmers' fields on various aspects of Broccoli cultivation like nutrient management, pest management etc.
- ii. On Farm Trials (OFTs) in the Farmers' Fields  
The Rathindra KVK has started to conduct the OFTs in various aspects of Broccoli cultivation in farmers' fields from 2010 – 11 to 2012 - 13. Till now, 03 numbers of On Farm Trial (OFT) of Broccoli Cultivation in Farmer's Field and the Broccolis were grown in 30 farmers' fields in two clusters in 5 villages covering an area of 0.63 hectares.

### **B. Technology Dissemination**

The Rathindra KVK has started to popularize the cultivation of Broccoli through Front Line Demonstrations (FLDs) being organized from 2013 -14 in 3 clusters, 12 villages, 43 farmers' plots covering

an area of 2.55 hectares of land in the Blopur- Sriniketan Community Development (CD) Block in Birbhum District.

In the Front Line Demonstration Programme on Broccoli the Average Gross Cost of Cultivation was Rs. 1,60,000.00 (Rupees One Lakh Sixty Thousands) / ha only, while the Gross Return was Rs. 3,12,500.00 (Rupees Three Lakhs Twelve Thousands Five Hundred) / ha only thus giving the partner Farmers a Net Return of Rs. 1,52,500.00 (Rupees One Lakh Fifty Two Thousands) / ha only with a Benefit : Cost (B:C) Ratio of 0.95.

### ***C. Skill Development Training Programme on Broccoli cultivation organised in the Rathindra KVK***

Till date, the Rathindra KVK has organized 06 numbers of Skill Development Training Courses involving 153 numbers of Trainees. In these Skill Development Training Programmes, various aspects of Broccoli Cultivation viz. nursery bed preparation, seedling raising, main field preparation, seedling transplanting, Integrated Irrigation Management Practices, Integrated Nutrient Management Practices, Integrated Pest Management Practices, Intercultural Operations, Signs of maturity, process of harvesting, Post-harvest operations etc. were thoroughly taught by following Experiential Learning Cycle (ELC) Method of Training.

### **Results of Rathindra KVK Initiatives for Introduction of Broccoli**

#### **Economic Advantages from Broccoli Cultivation over Cauliflower Cultivation**

<b>Cauliflower</b>	<b>Broccoli</b>
<b>Yield</b> - 120-150 quintals per hectare	<b>Yield</b> - 100 - 140 quintals per hectare
<b>Expenditure / Hectare</b> - Rs. 65,000 - 85,000	<b>Expenditure / Hectare</b> – Rs.90,000 - 1,10,000
<b>Gross Return / Hectare</b> – Rs. 1,10,000 – 1,45,000	<b>Gross Return / Hectare</b> – Rs. 1,70,000 – 2,10,000
<b>Net Profit / Hectare</b> - Rs. 45,000 - 60,000	<b>Net Profit / Hectare</b> - Rs. 80,000 - 1,00,000
<b>B:C Ratio</b> – 0.69 – 0.71	<b>B:C Ratio</b> – 0.89 – 0.91

### Changes in Vegetable Cropping Pattern in Birbhum District, West Bengal

What was?	What is?
No cultivation of Broccoli was there in Birbhum District before KVK intervention.	Now Broccoli is being produced in 3.55 ha area with a total Production of 500 Quintals in the Year – 2013-14.

#### Case Studies on Broccoli Farmers

1. Sri Mahadev Sarkar, aged about 50 Years, a resident of the Village–Baro Shimulia, P. O. – Panchshoya, Gram Panchayat–Bahiri-Panchshoya, Community Development Block- Bolpur-Sriniketan, Pin. – 731240, Dist. – Birbhum, Mobile Phone No. – 8670077649 is a partner Farmer of the Front Line Demonstration Programme of the Rathindra KVK for the last 2 Years in Broccoli cultivation.

Now Sri Sarkar is commercially cultivating Broccoli in an area of 0.13 ha of land. He is producing more than 8,000 pieces of Broccoli which is fetching a Market Price of Rs. 40,000.00 (Rupees Forty thousands) only from the Bolpur Town wholesale and retail markets in Winter Season. The Total Cost of production of Broccoli in 0.13 ha of land is nearly Rs. 10,000.00 (Rupees Ten thousands) only. Thus Sri Sarkar is earning a Net Profit of Rs. 30,000.00 (Rupees Thirty thousand) only from his tiny plot of 0.13 ha of land and this extra earning gives him a kind of economic security in the times of lean period.



Sri Mahadev Sarkar (Centre) along with other farmers in his Field of Broccoli



Broccoli Field of Sri Mahadev Sarkar



Sri Nilu Das in his Field of Broccoli



2. Sri Nilu Das, aged about 38 Years, a resident of the Village – Baro Shimulia, P. O. – Panchshoya, Gram Panchayat – Bahiri-Panchshoya, Community Development Block- Bolpur-Sriniketan, Pin. – 731240, Dist. – Birbhum, is a partner Farmer of the Front Line Demonstration Programme of the Rathindra KVK for the last 2 Years in Broccoli cultivation.

Now Sri Das is commercially cultivating Broccoli in an area of 0.08 ha of land. He is producing more than 4,800 pieces of Broccoli which is fetching a Market Price of Rs. 24,000.00 (Rupees Twenty four thousands) only from the Bolpur Town wholesale and retail markets in Winter Season. The Total Cost of production of Broccoli in 0.08 ha of land is nearly Rs. 6,000.00 (Rupees Six thousands) only. Thus Sri Das is earning a Net Profit of Rs. 18,000.00 (Rupees Eighteen thousand) only from his tiny plot of 0.08 ha of land and this extra earning gives him a kind of economic security in the times of lean period.



# The Significance of Peer Effects in Clustering of FDI in India after Liberalization

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## **Abstract**

*This study evaluate the location choices of 6020 foreign investors at the level of Indian districts. Employing conditional logit models, the study find that clustering of Foreign Direct Investment (FDI) is driven robustly by herding among investors from both, the same and other countries of origin. However, the behaviour of Nonresident Indians (NRIs) and German investors is outstandingly different.*

**Keywords:** *location choice; FDI; country of origin; Indian districts; conditional logit models.*

## **Introduction**

Foreign Direct Investment (FDI) boomed in India after previous restrictions were relaxed in the 1990s. Former Minister of Finance Chidambaram expected FDI 'to work wonders' (Indian Express, 11 November 2005). However, FDI appears to be strongly clustered in India, and to the extent that new foreign investors locate where their peers located before them, it would become increasingly difficult for regional policymakers to attract FDI to other locations. Previous empirical evidence on peer effects on location choices of foreign investors is surprisingly scarce.

Moreover, most existing studies consider large regional units and often neglect complex spatial effects such as market potential and distance-weighted clustering.<sup>1</sup> We contribute to closing these gaps by drawing on case-specific data on the location choices of foreign investors and Nonresident Indians (NRIs) at the level of 542 Indian districts.<sup>2</sup> The location choices of 6020 new investors in 2001–2003 represent our binary dependent variable, while the previous choices of peers are reflected in accumulated counts since 1991.

### Analytical background and hypotheses

Investors decide on a particular location based on expected profitability conditional on locational characteristics that relate to the business environment, economic geography and institutional conditions. Specifically, existing clusters may attract subsequent FDI by allowing for knowledge spillovers as well as access to markets and intermediate inputs. Thus, investor  $i$  will choose location  $j$  if profit  $_{ij} >_{ik}$ , for all possible locations  $k$ ;  $_{ij} = U_{ij} + \epsilon_{ij}$ , with  $U_{ij}$  representing the deterministic part and  $\epsilon_{ij}$  the error term. The probability of choosing location  $j$  is

$$P_{ij} = \frac{\exp(U_{ij})}{\sum_{k=1}^n \exp(U_{ik})} \tag{1}$$

In our Conditional Logit Model (CLM), the dependent variable takes the value of 1 if investor  $i$  chooses location  $j$ , and 0 otherwise.  $U_{ij}$  in Equation 1 is assumed to be a linear combination of the explanatory variables  $X$ :

$$U_{ij} = \beta_1 X_{ij}^1 + \beta_2 X_{ij}^2 + \dots + \beta_m X_{ij}^m \tag{2}$$

Of these, two explanatory variables account for peer effects, that is, previous location choices:

$$FS_j = Count_j + \sum_{j\mu s} \frac{count_{j\mu s}}{d_{j-m}} \quad \text{and} \quad FA_j = Count_j + \sum_{j\mu s} \frac{count_{j\mu s}}{d_{j-m}} \tag{3}$$

$FS_j$  refers to all previous investors from the same country of origin as investor  $i$ , while  $FA_j$  refers to all previous foreign investors from elsewhere. Both equal the sum of investors who chose location  $j$

(here, a particular district in India) and neighbouring locations (weighted by their distance from  $j$ ) prior to investor  $i$ .  $FS$  tells us if herding is particularly strong among investors from the same country of origin.<sup>3</sup> Larger local markets, proxied by population, are also expected to attract FDI. Accessibility of surrounding markets ( $MA$ ) relates to the population of locations within a radius of 500 km, discounted by distance. Industrial diversity is measured by the Herfindahl index calculated as the sum of squared employment shares of all industries in location  $j$ , with higher values reflecting less diversity. Cost-oriented FDI is theorized to locate where (nonagricultural) hourly wages are relatively low. On the other hand, FDI may draw on better qualified labour, which we capture by higher secondary education at the district level. The quality of local (physical) infrastructure is reflected by several indicators, including the availability of electricity, telephones, transportation (buses) and financial services (banks). Finally, we account for institutional conditions such as the flexibility of labour market regulations at the level of states and social unrest at the level of districts (riots).<sup>4</sup>

## Empirical findings

The results from our CLM are presented as odds ratios in Table 1. A ratio greater (smaller) than 1 implies a positive (negative) effect of the regressor on the probability of investor  $i$  choosing location  $j$ . The estimation in Column 1 is based on the full sample of investors during the years 2001–2003.<sup>5</sup> The explanatory variables are all significant, mostly at the 1% level. An increase in local market size (population) by 1% improves the odds of attracting an investor by about 16%. Accessibility of  $MA$  impairs the odds, however, negating the view that rural districts that are closer to large metro areas tend to receive more FDI. Rather, metro areas seem to divert FDI away from surrounding rural districts with limited market potential, thereby widening the urban–rural divide. Less industrial diversity (i.e. higher values of the Herfindahl index) reduces the odds of attracting an investor.

All indicators of physical infrastructure have a positive impact. The same applies to the educational attainment of the local workforce, whereas higher local wages are associated with an odds ratio considerably below 1. The latter finding clearly suggests that cost-oriented FDI plays a major role in India. Institutional conditions also matter, with flexible labour

market regulations improving and local social unrest impairing the chances to attract FDI.

**Table 1. Conditional logit model results – odds ratios**

	All	United States	United Kingdom	Germany	Japan	NRIs
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Population	1.1581*** (0.028)	1.4144*** (0.093)	1.1368 (0.149)	2.3185*** (0.372)	1.0974 (0.300)	1.6170** (0.359)
FA	1.7121*** (0.038)	1.2967*** (0.093)	1.6508*** (0.252)	0.9416 (0.104)	1.3206 (0.300)	0.7552 (0.225)
FS	1.0563*** (0.009)	1.2580*** (0.072)	1.0665 (0.124)	0.8291*** (0.047)	1.1543 (0.123)	1.1273 (0.174)
Herfindahl	0.9077* (0.049)	1.9240*** (0.390)	0.8021 (0.245)	0.8307 (0.133)	0.5710 (0.232)	2.6562* (1.516)
MA	0.8320*** (0.040)	0.8153 (0.105)	0.7564 (0.150)	0.7725** (0.100)	0.6662 (0.290)	0.8804 (0.630)
Electricity	1.4067*** (0.099)	0.4563*** (0.112)	1.2088 (0.506)	0.9622 (0.264)	7.0052* (7.862)	1.5101 (2.970)
Telephones	1.0919** (0.040)	1.9462*** (0.219)	1.1938 (0.169)	1.4977*** (0.206)	0.6643 (0.280)	2.9057** (1.407)
Education	1.1383*** (0.038)	1.8460*** (0.181)	0.9735 (0.156)	0.9151 (0.106)	0.9904 (0.423)	1.2223 (0.678)
Buses	1.2981*** (0.052)	3.7268*** (0.513)	1.0280 (0.256)	0.9682 (0.171)	0.3796** (0.143)	2.6153** (1.181)
Banks	1.5261*** (0.047)	1.9405*** (0.134)	1.2394 (0.251)	1.5160*** (0.182)	1.1759 (0.274)	2.5405** (0.939)
Wages	0.6828*** (0.034)	0.2520*** (0.052)	0.4291** (0.159)	0.8269* (0.091)	0.4729 (0.326)	0.7165* (0.137)
Labour regulations	1.6521*** (0.090)	1.1592 (0.279)	1.0234 (0.386)	1.0644 (0.268)	1.7481 (0.677)	1.4006*** (1.043)
Riotsn	0.8166*** (0.037)	0.2026*** (0.047)	0.9291 (0.154)	0.6620** (0.106)	2.4370 (1.350)	0.0710*** (0.059)
Observations	261743	24 255	3 236	6 027	2 342	1 730
AIC	18 143.55	3 652.14	787.84	1 406.66	722.07	679.28
BIC	18 279.73	3 757.39	866.90	1 493.82	796.93	750.21

Notes: NRI, Nonresident Indians; AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion. Robust SEs in parentheses.

\*, \*\* and \*\*\*Significant at p , 0.10, p , 0.05 and p , 0.01, respectively.

Turning to peer effects, both *FA* and *FS* enter with an odds ratio significantly above 1. It may be surprising that the effect of a 1% increase in the count of previous investors from the same country of origin raises the odds of attracting a new investor by just 6%, compared with 71% with regard to investors from other sources. Nevertheless, the impact of increasing the absolute count by one previous investor is typically stronger for *FS* than for *FA*, especially when the number of peers from the same country of origin is very small compared with peers from all other countries.

In the next step, we assess whether the general pattern holds for subgroups of investors from major countries of origin. In Columns 2–5, we report the odds ratios for investors from the United States (28.1% of all FDI cases in 2011–2013), the United Kingdom (8.5%), Germany (7.1%) and Japan (5.3%).<sup>6</sup> Column 6 provides the odds ratios for FDI by NRIs (4.3%), who may behave differently because of closer contacts and better knowledge of local conditions.

Similarities across subgroups of investors exist with regard to the impact of population and wages. Yet, the local market orientation of German and NRI investors appears to be particularly strong. By contrast, US and UK investors are particularly cost oriented, as reflected in odds ratios substantially below 1 for the wage variable. The accessibility of surrounding markets does not attract FDI from any source, corroborating the general pattern.<sup>7</sup>

The impact of physical infrastructure on FDI from particular sources is more ambiguous than in Column 1. Specific indicators are often insignificant, and subgroups of investors appear to focus on different aspects of infrastructure. The evidence is strongest for financial services (banks). Institutional conditions matter for most subgroups of investors. Flexible labour market regulations at the state level encourage US investors.<sup>8</sup> NRIs are discouraged most strongly by social unrest at the district level, possibly because they have better knowledge of local law enforcement.

Remarkably, peer effects vary considerably across subgroups of investors. The odds ratios of *FS* and *FA* are almost the same for US investors, indicating strong patterns of herding. UK investors appear to behave similar to the general pattern. The surprising finding that

German investors avoid locations where national peers invested earlier may be related to their strong local market orientation.<sup>9</sup> Established peers may be regarded as competitors having occupied profitable markets, rather than frontrunners showing how to reduce FDI-related risk.

Finally, Column 6 suggests that peer effects do not drive NRI investors, possibly since they are more familiar with local conditions and can afford more autonomous location decisions. However, the odds ratios of *FS* typically turn out to be significantly above 1 in (unreported) specifications with specific indicators of infrastructure excluded. Hence, NRIs might ignore previous location choices by other foreigners and yet rely to some extent on previous location choices by their fellow NRIs.

## Conclusion

This article makes an important contribution to the understanding of peer effects and locational determinants driving foreign investment decisions. Using new FDI data in India we find that investors are often attracted to districts that their national or other peers previously favoured. This would imply that with regard to FDI, geography might increasingly become destiny, and the scope of public policy might be limited.

## Foot Notes:

1. Recent examples include Bobonis and Shatz (2007) on US states, Cheng and Kwan (2000) on Chinese provinces, Crozet et al. (2004) on French departments and Ledyaeva (2009) on Russian regions.
2. The data on Foreign Direct Investment (FDI) approvals were kindly made available by the Department of Industrial Promotion and Policy of the Ministry of Commerce and Industry. Note that Nonresident Indians (NRIs) are regarded as a distinct source of FDI in the database.
3. Conditional Logit Models (CLMs) are potentially biased by the assumption of the Independence of Irrelevant Alternatives. However, count models do not offer a superior alternative in the present context since investors' choices need to be matched on a one-to-one basis by country of origin.
4. The data for the explanatory variables relate to 2011. For more detailed information on the definition of variables, sources and summary statistics, see Appendixes 1 and 2 as well as the working paper version of this article at <http://www.ifw-members.ifw-kiel.de/publications/the-clustering-of-fdi-in-india-the-importance-of-peer-effects/kwp-1697>.
5. We report only the full specification of the CLM. We performed several robustness tests



with a restricted set of determinants in order to mitigate possible multicollinearity. The results (available on request) proved to be robust to these changes

6. Since the results for Japan are sensitive to changes in the specification (e.g. when dropping specific indicators of infrastructure), we do not consider the estimation in Column 5 for the subsequent discussion.

7. US investors and NRIs seem to be attracted to districts with higher concentrations of industrial activity (rather than diversity), although these results are not robust to changes in the model specification.

8. US investors are also peculiar insofar as they prefer districts with a better educated labour force.

9. Similarly, Crozet et al. (2004) found that German FDI in France does not agglomerate but is rather dispersed.

## Appendix 1: Explanatory Variables – Description and Sources

Variable	Definition	Source
Economic geography	Herfindahl	Herfindahl index; smaller index values reveal greater economic diversity
	<i>MA</i>	Market access; population in surrounding district, weighted by distance from district <i>j</i>
Census/orthodromic	Population	Total population of district <i>j</i>
Business Environment/ infrastructure	Wages	Nonagricultural hourly wage rates
	Electricity	Proportion of villages with access to electricity
	Telephones	Proportion of villages with access to telephone connections
	Education	Proportion of population with higher-secondary education
	Buses	Proportion of villages with bus services
	Banks	Banking branches per 1 lakh population

Institutional variables	Flexibility of	Besley and Bur-	regulation state
Labour	labour mar-	gess(2004)	level
	ket regula-		
	tions at the		
	Riots	Number of riots per	Marshall and
		capita	Marshall
<a href="http://www.systemicpeace.org/">http://www.systemicpeace.org/</a>			
			<a href="#">inscr/inscr.htm</a>
Previous FDI	<i>FA</i>	Previous FDI (all	Ministry of
		countries of origin,	Commerce and
		excluding <i>FS</i> )	Industry
	<i>FS</i>	Previous FDI (same	Ministry of
		country of origin)	Commerce and
			Industry

Notes: 1 lakh=100 000. NSSO, National Sample Survey Organisation; CMIE, Centre for Monitoring of the Indian Economy; FDI, Foreign Direct Investment.

## Appendix 2: Descriptive Statistics

Variable	Expected sign	#	Mean	SD	Mini- mum	Maximum
Investment decisions <sup>a</sup>	542	38	167	0	1 289	
Herfindahl	—	533	0.2995	0.2085	0	1
MA	+	530	322 228	624 025	534	7 397 880
Population	+	533	2 514 384	1 925 607	0	12 300 000
Wages	—	454	102.11	59.43	18.67	525.39
Electricity	+	454	0.6879	0.2299	0	0.9977
Telephones	+	454	0.1341	0.1056	0	0.6212
Education	+	454	0.0752	0.0443	0	0.2368
Buses	+	533	0.6535	0.6531	0	1
Banks	+	415	8.14	3.81	1.99	26.09
Labour regulations	+	490	0.3534	0.4780	0	1
Riots	—	427	0.00009	0.00011	0	0.00102
FA	+	542	84	199	0	1 394
FS	+	542	2	11	0	314

Notes: # refers to the number of districts for which there are observations.

a :Reference years: 2011, 2012 and 2013

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# Tripura's tryst with Rubber

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## Abstract:

*Rubber Plantations have been seen an engine of growth and a harbinger of peace in the development process of the small North Eastern state of India, Tripura. Considered as the second rubber hub of India, Tripura is an example of integrated efforts by various stakeholders including government agencies who used rubber plantation to wean away landless tribal cultivators from shifting cultivation. The encouraging signals from the international market have also contributed to the growth process; however, the vagaries of market forces have created threats to the sustenance of the sector in the last couple of years. Further, the rapid growths of rubber plantations have escalated the associated threats of monoculture. The present paper attempts to trace the process of development of the sector, as well as to discuss the causes and the impact of and the challenges to the growth of rubber plantation.*

**Keywords:** *Natural Rubber, Plantation, Rehabilitation, Growth, Tripura*

*JEL Classification: O13; Q28; R52; R58*

## Introduction

Natural Rubber (NR) has been a growth engine of Tripura for the past few decades. In course of 50 years, the state has emerged as

the 2nd largest rubber-growing region of India. Initiated as part of afforestation by the State Forest Department in 1963, this vital ingredient for modern civilisation has been identified as the most potent force in the development of Tripura. It may be recalled that the usage of NR is positively correlated to the size and degree of automation of an economy (Bhowmik, 2008) and its demand is spread across the globe. However, the requirement of a specific agro-climatic condition restricts the supply of the product to a few geo-specific locations. An industrial raw material for almost 50000 goods, NR is a highly traded item in the international market with more than 65% of its global consumption comprising imports. India's position is unique in the international rubber economy; it is among the toppers in terms of both consumption and production. But, the Indian Rubber Economy has been in the downswing for the last two years; especially with price of NR plummeting from a high of above Rs 200 per kg to less than Rs. 100 per kg, there has been a major crisis among the stakeholders of rubber plantation. The declining price has made rubber production unviable, leading to a situation where almost 40% of the growers have stopped tapping and many of them have either cut down plantations or shifted to other crops like Cocoa and Nutmeg. The slump in the sector is visible in its reduced production and the reduced productivity of the crop (NRPPD, 2016; Joseph, 2016).

It may be noted that Kerala has been the traditional rubber-growing region of India but land saturation in the state has noticeably curtailed its further expansion. The Rubber Board, the nodal agency for the commodity in the country, had been in pursuit to discover newer areas to meet the ever-increasing demand for rubber and, accordingly, it has developed several schemes for augmenting the area under the crop as part of policy initiatives since its inception after India's independence. The National Bureau of Soil Survey and Land Use Planning had identified that 650000 hectares (ha) of plantations can be raised in the North-eastern region of India with 200000 ha in Assam and 100000 ha in Tripura in the early 1980s, which facilitated extensive extension services by the Rubber Board often in association with the state governments. Thus, today, we find that rubber plantations have been identified as a game-changer in the development paradigm of the remote state of Tripura.

**Table 1: State wise area & production of Natural Rubber in 2013-14**

State/ Zone	Total Area		Production (T)	
	In hectares	Share (%)	In Tonnes	Share (%)
1. Traditional				
Kerala	548225	70.4	648220	83.8
Tamil Nadu	20890	2.7	25000	3.2
Sub Total	569115	73.1	673220	87.0
2. Non Traditional				
a) North-Eastern				
Tripura	71370	9.2	39000	5.0
Assam	47945	6.1	13600	1.8
Meghalaya	13875	1.8	7570	1.0
Other NE states	22430	2.9	3520	0.4
Sub Total	155620	20	63690	8.2
b) Other States				
Karnataka	47055	6.1	35230	4.6
Others	6610	0.8	1860	0.2
Sub Total	53665	6.9	37090	4.8
<i>Grand Total</i>	<i>778400</i>	<i>100</i>	<i>774000</i>	<i>100</i>

Notes- Figures in parentheses indicate percentage; T-tonnes; ha- hectares

Source- Rubber Grower's Companion 2015

With 71370 hectares of plantation, 37346 hectares of tappable area and 44740 tonnes of production in 2014-15 (ERT, 2016), Tripura leads the non-traditional rubber growing zone of India. Natural Rubber accounts for approximately Rs 600 crores per annum, which is around 3 to 3.5% of the Gross State Domestic Product of Tripura. Even though the data on area under rubber plantations provided by the state government and the Rubber Board varies marginally, there is no doubt that Tripura is the 2nd largest grower of NR in the country, as it will be evident in Table 1 below. With 9.2% of total area of the country, the state produced around 5% of the total production in

2013-14. Kerala is the time-honoured leader, accounting for 70.4% area and 83.8% of the total production.

It may be noted that the predominantly agrarian economy of Tripura is characterised by minimal industrialisation, transport bottleneck, inflated population, large involuntary unemployment and limited capital formation. The tribal dwellers of the state have traditionally lived in the hills and mostly pursued shifting cultivation, while the non-tribal folk have lived in the intermittent valleys and practised traditional wetland agriculture. However, with partition-led alteration of the demographic profile of the state, the land-man ratio declined; it also accentuated active state intervention for the development of the state and its people. Subsequent to the merger of Tripura with India in 1949, the government sector emerged as the most prominent employer and investor in the state economy. As part of the policy regime, developmental interventions across the economy became a priority for the state and the success of the trial rubber plantations provided a paradigm hitherto unknown.

The present paper is an attempt to study the development experience of the rubber plantation sector in Tripura. Briefly, it is structured in four sections, including the Introduction; the second section provides a historical account of the growth of rubber plantations in Tripura, while the third section, which accumulates the various features of rubber plantation in the state, contains sub-sections on area, production and yield farm economics, causes and impact of growth, pullback factors and emerging scenario; the last section concludes the study.

### **The Historical Perspective**

The earliest plantations of NR came up at Patichhari in South Tripura and at Manu in North Tripura as part of afforestation activities of the state government. The huge canopy of the rubber trees provided a fillip to the green cover and encouraged the forest department to extend the available area under plantation. Denuded and degraded forest lands, exposed to slash and burn cultivation, were earmarked for rubber plantations; the efforts got a boost with the Rubber Board setting up its one-man field office in 1967. By 1972, Tripura had more than 100 ha of plantations.



The state government was quick to realise that NR, owing to its perennial nature and industrial linkage, can provide long-term economic opportunities for the poor and marginalised sections of the state population. It can, on the one hand, provide substantial income to rubber growers and, on the other, add to the domestic supply of this important industrial raw material. Further, rubber plantations had the potential to act as a viable means for resettlement of landless tribal shifting cultivators, commonly known as '*jhumias*' in the local parlance. The self-sufficient *jhum* economy of the earlier days was in crisis owing to the increased pressure on land and the declining fallow cycle; it was a threat to the environment too. Rubber was considered as a possible means to wean away the *jhumias* to a settled form of livelihood.

The Tripura Forest Development & Plantation Corporation (TFDPC), formed in 1976-77, was asked to implement a rubber-based rehabilitation package for the landless shifting cultivators at Warrangbari, near Bisramgunj, West Tripura. The corporation also had the authorisation for the commercial management and operation of all plantations raised previously by the Forest department. The regional office of the Rubber Board was established in 1979 at Agartala; subsequently, the Nucleus Rubber Estate and Training Centre became functional in 1984 with the Jt. Rubber Production Commissioner, Rubber Board as the administrative head under the scheme of Accelerated Rubber Development in the North-East. The activities of the Rubber Board in the state received a great impetus following the Cash Subsidy Scheme introduced in 1980. The extension activities of the Board comprising free distribution of planting materials (i.e. polybag & budded stumps), provisions for maintenance cost, fencing materials and technical advice resulted in the expansion of the plantations under private ownership too. The scheme of Financial Subsidy and the potential of the crop in furthering a viable economic opportunity led to the formation of the Tripura Rehabilitation & Plantation Corporation (TRPC) Limited in 1983 with the specific objective of the settlement of landless tribal people for reclamation of land under *Jhum* cultivation. The corporation is mandated to help the beneficiaries in not only setting up plantations, but in the processing and marketing of rubber as well. A significant role has been played by the TRPC in expanding plantation

area in following years, including the rubber-based rehabilitation of surrendered extremists, in accordance to the peace accord between the state government and the Tribal National Volunteers (TNV) in 1988-89. The much-acclaimed 'Tripura Block Plantation Project' was initiated by the Rubber Board in collaboration of the Department of Tribal Welfare, Govt. of Tripura and with the sponsorship it received from the World Bank in 1992-93. The operational infrastructure of the Rubber Board expanded with the establishment of regional offices at Udaipur (in South Tripura district) and Dharmanagar (in North Tripura district) in 1988 and 1994 respectively. Buoyed up by the success of rubber-based rehabilitation programmes, the State government introduced two other agencies – the office of the Tripura Tribal Areas Autonomous District Council (TTAADC) and the office of the Sub-divisional Magistrates (SDM) for the purpose (Bhowmik, 2006).

It may be noted here that the resettlement schemes for tribal beneficiaries generally provide for land occupancy rights over one hectare per household with income accruing to the recipient on the sale of latex and ribbed smoked sheets as soon as the trees mature and reach the tapping stage. Natural Rubber is a long duration crop with a seven-year gestation period. During the immature stage, the beneficiary is engaged as a labourer in his own field for land development and production augmenting activities on a wage basis by the rehabilitating agency. Moreover, intercropping of banana, pineapple, etc. are encouraged for ancillary income. The beneficiary is entitled to the various financial subsidies of the Rubber Board and provided technical support and training by the implementing agencies in active cooperation of the Rubber Board. Resettlement programmes club together the beneficiaries of an area into a group behaving as a single unit for the processing stage to reap the economies of scale. In most cases, the beneficiaries tap their trees and bring the latex to the processing centre, where it is coagulated, laid, smoked and dried into sheets. The beneficiary is then paid in accordance with the quantity of latex and its dry rubber content. This rehabilitation model of landless tribal jhum cultivators was utilised *mutatis mutandis* by other rehabilitating agencies such as the Department of Tribal Welfare and the Tripura Tribal Areas Autonomous District Council

(TTAADC), besides the three major agencies – the TFDPC, the TRPC and the Rubber Board. The total plantation area promoted by the three major rubber-promoting agencies – the Rubber Board, the TFDPC and the TRPC – account for almost 20000 hectares in the state. In this context, it may be noted that the TFDPC Ltd is the largest rubber-growing agency in the country, having more than 11000 ha of plantation under its aegis. Each of the two other agencies contribute to about 2000 hectares. Thus, more than one-third of the total rubber area in Tripura has grown as part of development intervention by the state (Viswanathan & Bhowmik, 2014). In 2006, the state government constituted the Tripura Rubber Mission with a mandate to increase the rubber area to 85094 hectares in 2025-26. Plantations were to be raised in degraded forestlands and also on patches of land available along the international border with Bangladesh.

The expansion of rubber plantations at the early stages was mostly confined to the public sector initiatives. Rehabilitation programmes and plantations managed by the TFDPC formed the crux of the total area in the state until the 1980s. Private plantations grew at a comparatively slower rate than the public sector plantations. In that period, the problem of insurgency had affected the production of rubber; many sizeable plantation areas were destroyed and several abandoned. It is reported that nearly 3000 hectares of plantations managed by the TFDPC were lost. The change came in the late 1980s and the early 1990s, when increased official and staff strength of the Rubber Board boosted the extension activities. In the mid 1990s, the booming price of NR was an attraction for many private growers. Sadly, interests declined with the fall in the price following the Asian Financial Crisis of 1997.

However, with the international markets of rubber showing signs of revival in 2002-03, the interest in the sector renewed. From 2004, the boom in the rubber market touched unprecedented heights; the prices of NR soon skyrocketed, leading to a craze, particularly from investors belonging to the private sector. Private plantations started coming up in a large way, often at the expense of natural forests. Illegal plantations in occupied forestlands were reported from many corners of the state. People from all sections

of the society started showing interest in the sector and it was not just rural people but many urban dwellers began investing in plantations. These plantations were mostly small in size and often set up without proper legal procedures. Several cases of illegal leasing in lands from the tribal owners by the non-tribal people were reported in the TTAADC areas. At the same time, many tribal elites, most of them government employees residing at Agartala, either purchased land or converted their ancestral property to rubber plantations. Permits from the Rubber Board were not always sought, thus rendering them ineligible for receiving support and incentives from the nodal agency. Moreover, Plantation owners often acquired planting materials from spurious nurseries, which, in most cases ignored the prescribed agro-management practices, were compromised. Almost 14000 hectares of new rubber plantations were raised in three years; beginning from 2006-07 and the majority of these plantations were by the private sector entrepreneurs. The prices of NR in Tripura did not suffer much even during the Global Financial Meltdown of 2008-09 (Bhowmik, 2012). The falling prices revived in a few months, and reached unprecedented heights with the zenith being in April 2011.

In late 2011-12, the slump in the NR market began and it has remained unchanged since then. Profitability has plummeted leading to a panic amongst the growers, many of who are now in search of ways and means to withdraw from the sector. It may be noted here that, the rise and fall of NR prices are not unusual, rather it is expected as in the manner of the business cycle fluctuations of the capitalist mode of production. The outcome of such movement is that the small rubber growers of Tripura, albeit unknowingly, have got themselves entangled with the vagaries of international market.

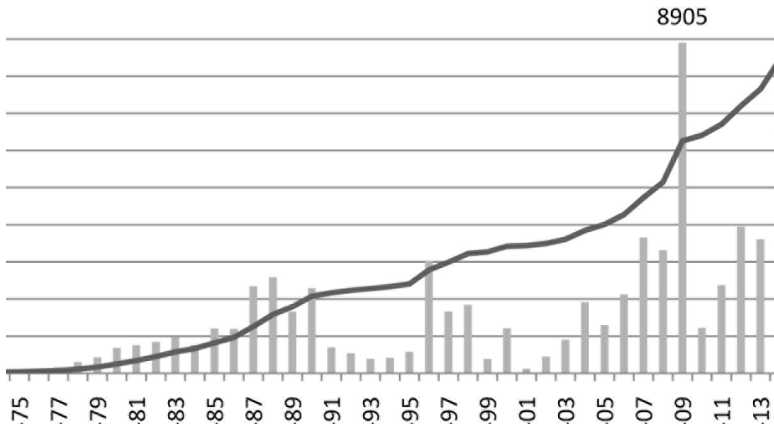
## **Features of Rubber Plantations in Tripura**

### ***3.1 Area, Production and Productivity***

Figure 1 shows the steady growth of area under rubber plantations in Tripura. Interestingly, we also observe that more than 2000 ha of new plantations have been added every year since 2005-06, with the solitary exception of 2009-10. The incremental area was the highest, 8905 ha, in 2008-09. Basically, the area under plantations doubled since

2005-06, and, as already mentioned in the previous section, this expansion has been mainly because of the attractive price fetched by NR.

**Fig: 1- Area under Rubber Plantations in Tripura (in ha.)**



Notes: Total Area in Primary 'Y' axis and Incremental Area in Secondary 'Y' axis

Source: Various issues of Indian Rubber Statistics

**Table: 2- Tappable Area, Production and Productivity of NR in Tripura**

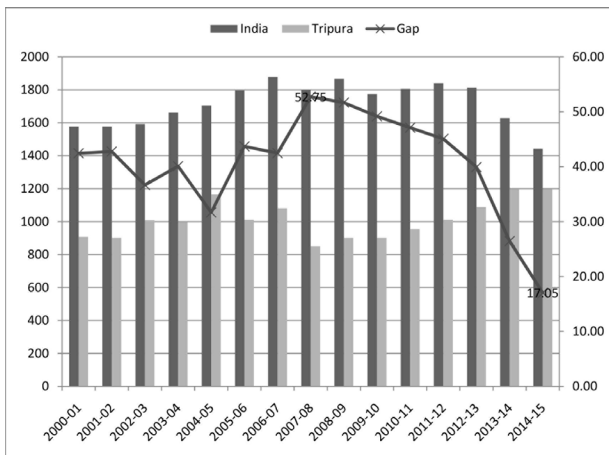
Year	Tappable Area (ha)	Production (MT)	Productivity (kg/ha)
2000-01	11000	9980	907
2001-02	14418	12999	902
2002-03	17701	17849	1008
2003-04	14958	14905	996
2004-05	13184	15364	1165
2005-06	16937	17122	1011
2006-07	19957	21575	1081
2007-08	27164	23088	850
2008-09	28375	25588	902

2009-10	29737	26810	902
2010-11	31102	29698	955
2011-12	31977	32332	1011
2012-13	33344	36300	1089
2013-14	31116	37277	1198
2014-15	37346	44740	1197

Source: Various issues of Indian Rubber Statistics, Basic Statistics of Tripura & Economic Review of Tripura

Table 2 shows that the tappable area in the state has increased 3.5 times from 2000-01 to 2014-15. At the same time, the production of rubber has increased from about 10000 tonnes pa in 2000-01 to almost 45000 tonnes in 2014-15. Thus, Tripura's emergence as the second rubber hub in the country is due the fact that new areas have matured in recent years. Again, from the same table, we may comfortably infer that, despite wide fluctuations, the yield rates have improved by almost 300 kgs/ha. The rates had been as low as 850 kgs/ha in 2007-08 but have moved up to almost 1200 kgs/ha in 2014-15.

**Fig: 2. Productivity of NR (kg/ha) in Tripura and India and the Productivity Gap (%)**



Source: Various issues of Indian Rubber Statistics, & Economic Review of Tripura

Notes: Productivity in Primary 'Y' axis and Productivity Gap in Secondary 'Y' axis

Gap =  $[1 - YI/YI] * 100$ , where YI- Yield in Tripura; YI- Yield for India

Fig 2 shows that the average yield of NR in Tripura has always been lower than the national average. The national productivity rates had been as high as 1879 kgs/ha, the highest in the world. But the Indian yield rates reduced substantially to about 1400kgs/ha in 2014-15. The poor productivity rates have been ascribed to structural infirmities arising from the ageing of plantation due to absence of timely replanting, climate change, labour shortage, extension of area to sub-optimal lands and poor quality of planting materials (Joseph, 2016). Nonetheless, the gap between the national average and the state average has consistently been in the vicinity of 40 % from 2006-07 to 2011-12. The gap in yield rate between the two regions has reduced in recent years no doubt but the gap remains and has been above 17% in 2014-15. It is understood that varied agro-climatic conditions between the traditional and the non-traditional zone is an important factor for the difference. Further, the dissimilarity in the nature of clone used for planting in the two zones also contributes to the difference. 'RRIM 600' is most commonly used in Tripura owing to its greater strength to withstand northwesterers and cyclones unlike Kerala, where the RRII 105 variety, the highest yielding clone, is the most popular. Further, differences in the cultural practices – lower adaptation of rain-guarding mechanism– contribute to the gap. Last but not the least, the quality of tapping is a major factor for productivity (Bhowmik, 2008), which is often ignored in Tripura. The increased productivity of plantations in Tripura in recent years is mainly because the newly matured areas have comparatively better productivity owing to increased density of trees as well as because of usage of higher yielding variety clones in many plantations.

### 3.2 *Farm Economics*

The Economic Viability of Rubber Plantation has been the prime cause for its popularity in the state. Though the crop has a long gestation period, it provides assured income for 32-35 years and is capable of gainfully employing 1 person/ha for its entire economic life. The standard profitability parameters such as BC Ratio, IRR, NPV, Payback period and MIRR indicate the monetary feasibility of

rubber plantations even under conservative price regimes (Bhowmik, 2006; Bhowmik, 2008), while in periods of higher prices, the returns are even higher (Dey, et al, 2014; Ghoshal, 2014). Moreover, the returns enjoyed by rehabilitated beneficiaries are much, if not double, as each beneficiary acts simultaneously as an owner operator and saves the cost of labour.

The globalised nature of the crop has made the domestic price of rubber a function of the international prices; hence, the recessionary trend in the prices since 2012 cut down the profits. Preliminary estimates made on the basis of a pilot survey undertaken by the scholars of Tripura University in April, 2017, shows that the variable cost of production for a matured plantation is around Rs. 100000/ha pa, while the returns are approximately Rs. 140000/ha allowing a business income of Rs. 40000/ha approximately. Farms employing family labour obviously enjoy a higher business income; during the mature phase, the major cost is incurred as cost of labour. Further, apiary, intercropping, selling of rubber wood are the sources of supplementary income to the farm. Nevertheless, with international crude oil prices hovering around its current level and decreasing imports of NR from China, the price of NR does not show much signs of recovery. It may be noted that the cost of production in Tripura, when compared to Kerala, is lower, owing to much lower cost of labour; as a result, the producers have not faced the shut down point. However, the situation has improved for the farmers as the prices have shot back from a low of Rs. 100/kg in April, 2016.

### 3.3 *Causes of Growth*

Apart from the economic viability and the consistent demand from the domestic rubber goods manufacturing industries, the other major factors for the growth and development of the NR sector in the state have been the effective extension efforts of the Rubber Board and its coordination with the rubber promoting agencies of the state (TFDPC, TRPC, etc). The Rubber Board had an advantage over the other commodity Boards such as Coconut and Spices Board owing to its larger official infrastructure and manpower in the North Eastern region and Tripura in particular. Another major factor behind the success of the crop has been the institutional support in marketing.



The rehabilitating agencies of the state has ensured a steady market for the beneficiaries, as all of them has their own marketing wings that buy crude rubber and process it for further value-addition, acting as a rubber trader. The setting up of the Manimalayar Rubber, the subsidiary of Rubber Board, has further provided a fall back option to the growers. The declining tea sector and the uncertainty of horticultural crops in the state have also fuelled the growth of NR (Viswanathan and Bhowmik, 2014).

### 3. 4 *Impact of Growth*

The foremost impact of the growth of NR in Tripura has been the improved quality and standard of life of numerous landless shifting cultivators (Joseph, et al, 2010; Viswanathan, 2005, Viswanathan and Bhowmik, 2014). The annual income of tribal rehabilitated beneficiaries has increased more than 10 fold, owing to the regular flow of income from the plantations. Unfortunate to have had a meagre subsistence on the less productive *jhum* cultivation, these people were bereft of the numerous development initiatives of the government. The *jhumia* household moved from one place to another in search of new lands for cultivation; as a result, health and education facilities were mostly beyond their reach. However, rubber plantations have provided regular employment and settled them to a particular place, thereby facilitating the institutional benefits that have lead to noticeable improvement in the human development component of these households. The children of these households are not illiterate like their ancestors; rather many of them have obtained their education at various parts of the country and abroad and are well settled in other vocations. The asset base of the grower households have widened along with improved housing conditions, consumer goods and nutrition (Kuki & Bhowmik, 2013). Development interventions from the state and the central government have also improved the infrastructural facilities of the plantation areas thereby accelerating on the whole the process of growth. The non-tribal rubber growers too have reaped benefits of consistent returns from the sector.

The Land use statistics of Tripura indicate the cropping intensity in the state increasing from 176% in 2004-05 to 186% in 2012-13 though both the gross cropped area and the net cropped area has

reduced. A rise in NR area from 6.1 % to 11.2 % during the period is evident in the data on cropping pattern; of course, it has all come at the expense of natural vegetation, old trees, including medicinal plants. There are many reports of NR plantations being promoted illegally through encroachment of forest areas (Viswanathan and Bhowmik, 2014). The traditional agrarian economy of Tripura has undergone a change and that is likely to have an impact on the issue of food security (Mohanakumar, 2012).

Owing to the overall industrial backwardness of the state, the process of value-addition in the NR sector of Tripura appears to be thwarted. Large-scale industrial investment has been restricted by the size of the market and the high transportation costs. The initiative that the Government of Tripura has taken by setting up of a Rubber Park covering 90 acres of land at Bodhjungle Industrial Estate for Rubber based industrial development, in 2011, is likely to augment the manufacturing base. More than 20 manufacturing units have registered for setting up their unit and a few have already started functioning with products like – Rubber thread, latex products and Block rubber. Besides, there are more than 230 licensed dealers involved in rubber trading and transportation. With further diversification and specialisation the requirement of skilled manpower is increasing. The B.Voc programme in Rubber Technology at Tripura University is an attempt to cater to the growing need.

### ***3.5 Pullback factors***

The surge in NR plantations has its share of problems also. Small rubber growers have opined that apart from the vagaries of the market and their declining fortunes, environmental issues also trouble them. The foul odour emitted during the processing of latex to sheet rubber is considered to be badly affecting the health of the workers (Viswanathan and Bhowmik, 2014); the disposal of wastes from the processing centres is an issue of concern too. Added to these, there is a growing sentiment in the state that NR plantations are not eco-friendly and are primarily responsible for climate change in the region. No scientific studies are, however, available to prove or disprove such a claim. Nonetheless, rubber plantations being monoculture is always a threat to the sustenance of bio-diversity,

though more than 40 species of flora belonging to 30 families have been recorded in the plantation area (Jacob, 2000). By comparison, the extent of biodiversity is certainly more obvious in the natural vegetations of areas adjoining to the rubber plantations in Tripura (Deb, et al, 2014).

Another major challenge for the sector has been the poor quality of planting material that flood the market, especially during the price boom. Unscrupulous middlemen and traders have ruined a generation of rubber growers by taking advantage of their simplicity and faith, particularly in the period after 2004. The absence of a system of certification of the planting material has added to the woe. Inferior planting materials lead to low production, less productivity and profitability but this is realised only when the trees mature, after a period of six-seven years.

It may be noted here that the existing laws of Tripura restrict the transfer of land ownership rights from a tribal person to a non-tribal person. With the booming NR price and the mad rush for plantation, a trend of leasing of tribal land, albeit illicitly, had developed. Non-tribes often rented or leased land in tribal areas for plantation and appointed the original owner as wageworker for maintenance. There are reports that in quite a number of instances, such agreements, which are often without any legal standing, have been dishonoured by the second generation when the question of inheritance of property came up. On the other hand, there are numerous incidences of urban ST dwellers buying land in the TTAADC areas (at low prices, because of limited buyers) and setting up rubber plantations. Inhabitants of the nearby region are mostly appointed as workers on wage basis and the owner is a prototype of an absentee landlord. Moreover, there are many instances of the rehabilitated shifting cultivator who, buoyed with the material gain over the years from rubber plantations, has appointed wage workers and turned himself into a rent seeker. Such a situation arose because the wards of many beneficiaries found tapping an extremely taxing work and preferred to pursue other or easier economic activities.

From the macro perspective, a major concern has been the lower yield, which can be raised considerably through adoption of better agro-management techniques. The quality of tapping has been

a significant drawback for the sector. Necessary training for the tappers have been organised by the rubber promoting agencies but the coverage has not been exhaustive. Untrained tappers are very common at the plantation. The TFDPC plantations provide incentives for better quality tapping in the form of achievement of target; yet, the lack of wage differentials between the trained (skilled) and untrained tappers in those plantations continues to be a crucial drawback. Further, the wageworkers of the rubber plantations have been mostly left out from the prosperity. The growth rate of wages of rubber tappers has been lower than the growth rate of income from rubber plantations (Chouhan & Bhowmik, 2015). All workers of TFDPC plantations are covered under the provisions of the Plantation Labour Act, 1951 and assured a minimum standard of living and income. Yet, the labour households do not miss any opportunity to generate additional income whenever there are MGNREGS activities in the locality. The situation for workers of the privately owned farms is worse by comparison. They have no job security, and as workers of 'small-holdings', they are not entitled to the benefits of PLA, 1951. These people have no option other than to look to the government for social security. The average wage of a rubber tapper is much lower than that of an unskilled worker; however, the workers prefer to stick to the sector because of the long-term employment potential. In this context, we may note that almost all workers of the TFPDC plantations across the state are members of the 'Tripura Rubber Sramik Union' affiliated to the CITU not only for their work rights but also as a strategy to be in the proximity of the centre of power and thereby avail various government facilities and support (Bhowmik & Viswanathan, 2015). On the other hand, it is observed that rehabilitated rubber growers are content with whatever they get; they are not conscious of the quality aspect. A fact that deserves to be noted here is that savings is yet to develop as a habit among the tribal beneficiaries who tend to spend a good deal of their earnings on conspicuous consumption.

### ***3.6 Emerging Scenario***

The craze for rubber plantations in the private sector has been on the wane following the depression in the prices of NR. But the demand for new plantations is not entirely gone. The implementation of the Scheduled Tribes and other Traditional Forests Dwellers (Recognition

of Forests Rights) Act, 2006 by the government of Tripura has allowed the allocation of 'patta' to more than 100000 ST forest dwellers eager to plant rubber in their lands. They have witnessed the benefits accruing to their neighbours and relatives and remain least bothered about the fortunes of the international market. On the other hand, the 'Tripura Land Revenue and Land Reforms (TLRLR) Bill, 2013' earmarks 54 acres as the land ceiling for a contagious rubber plantation unit and bans cultivation of rubber in tea plantations. As of now, estates enjoying economies of scale are not possible in Tripura, and corporate investments remain confined to rubber plantations.

Undoubtedly, the maturing of new plantations every year adds to the total production but most of these plantations were been set up during the boom when the expectations of the growers had been immense. With falling prices, they are largely disheartened and compelled to seek out the means to minimising cost of production. One of the commonest ways adopted is reducing the number of tapping days, which consequently reduces the total of hired labour days and cuts down the labour cost. The sufferer here is the worker; while the changing of the tapping pattern does reduce the collection of total latex, it increases the dry rubber content and, thus, marginally affects the producer's income. Rubber growers are candid enough to acknowledge that since nominal wage of the labourers cannot be reduced, they have no other way to cut down costs but reduce the tapping days. Moreover, as a cost saving mechanism, some growers have made compromises on the quality of the processing equipment by using Sulphuric Acid, instead of the recommended Formic Acid. Further, there are reports of emergence of a revenue sharing model between the tapper and owner alike share-cropping of traditional agriculture in remote tribal dominated areas (Bhowmik and Viswanathan, 2015).

## **Conclusion**

To sum up, one cannot deny the importance of NR in Tripura. It has been a harbinger of peace and development in the state. Almost 50000 households in the state are dependent on the rubber sector. It is true that the vagary of the international market has exposed the remote tribal beneficiary of Tripura to uncertainty but sustained efforts from the policy makers can minimise the threats. The crisis faced by the rubber growers in Kerala has been immense but the situation in

Tripura is still not appalling because the cost of production here is low and, unlike that of Kerala, there has been no intervention from the state government of Tripura. It may be noted that the Government of Kerala has initiated a Rubber Production Incentive Scheme in July 2015 whereby the difference between the scheme reference prices of Rs. 150 and the daily market reference price is credited to the farmer. However, with limited fiscal resources of the government of Tripura, such interventions appear distant.

For one who seeks an alternative, the current scenario creates a situation where one can speak of promoting the agro-forestry models of rehabilitation and development. Without a doubt, rubber can be a component of the mixed cropping pattern. Such a system will, on the one hand, minimise the threats issuing from the dwindling fortune of any particular crop market and, on the other, promote bio-diversity and lessen environmental challenges. However, this calls for remodelling the institutional architecture on which the government may seriously ponder. A Rubber census too may be undertaken to take stock of the reality in the near future.

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# Multidimensional Poverty Index:

## A Study of a Village in Purulia District, West Bengal

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### Abstract

*Multidimensional poverty index (MPI) is a measure of poverty covering non income dimensions like education, health and living standard. This measure can be done at the household level or at the community or country level. In recent times UNDP human development reports inform the multidimensional poverty of the countries. However, little attempt has been taken to explore the nature of regional level multidimensional poverty. This paper has tried to explore the nature of multidimensional poverty of a remote village in Purulia district in West Bengal. The UNDP methodology for measuring MPI has been applied in this study to gauge the incidence and intensity multidimensional poverty of Burda, a remote village belonging to Baghmundi block of Purulia district in West Bengal. Based on a set of primary data of 120 households this study has revealed that there is no problem of*

*hunger in the village. Income poverty is more serious compared to non income poverty measured by multidimensional poverty head count ratio. However, the incidence of multidimensional poverty among the scheduled castes and scheduled tribe households is higher than among the General and OBC households. The value of multidimensional poverty index is 0.44 for the sample households in Burda village.*

**Keywords:** *Income poverty, Multidimensional Poverty, Purulia District, SC and ST households*

## **Introduction**

Poverty means deprivation of socio-economic wellbeing and opportunities in life. Usually, poverty refers to income poverty. Since 1980s income measure of poverty has been criticized by different academicians. They have argued that poverty is not only a money matter; rather it is a multi-faceted issue. According to Sen (1998), money or income is necessary but not sufficient to reduce poverty. In order to alleviate poverty he proposed to reduce deprivations in living conditions of the people. Since 1990s poverty has been recognised with multiple dimensions like health, education, standard of living and entitlement, empowerment etc. The money metric measure of poverty fails to encompass these issues. The first successful attempt to measure multi-dimensional deprivations was Human Development Index (HDI) in 1990 proposed by Mahbub ul Haq. Since 1990, UNDP's Human Development Reports provides HDI as achievement index of the countries. HDI includes average income, longevity and educational attainment of a country but it does not take into account the distribution of human development within population subgroups or households. Hence, HDI is not applicable to measure the extent and intensity of poverty at the household level and at the individual level. The first effort to implement a multidimensional measure of poverty has been made by the UNDP in their Human Development Report, 2010, following methodology of Alkire and Santos, (2010). The MPI evaluates poverty based on a household's deprivation in three basic dimensions – health, education and standard of living. The main merit of MPI over HDI is that it is applicable at the country level and as well as at the household level. Therefore, this approach

is consistent with the household level empirical work which will be helpful for regional planning and development.

So far studies and reports did not provide district level MPI except Bagli (2015). Even HDRs of the districts in West Bengal did not cover the issue of MPI. In this paper we have tried to explore the incidence and extent of multidimensional poverty of the households in Burda Village, Purulia District, West Bengal.

The second section of this paper provides the background of the study village; the third section mentions the data source & methodology and the fourth section deals with the empirical findings. In the last section we have our concluding remarks.

### **Background of the Study Village**

Based on the available disseminated data from Census of India, 2011 table-1 and table-2 give a picture of the demographic and livings condition of the households in the area under study. In the district of Purulia, total residing households is 567824 of which nearly one fifth population in this district is belonging to SC community and 18.45 % population is belonging to ST community. In Baghmundi Block, total residing households is 27508 with a share of SC population in total population is lower than that in the district as a whole whereas share of ST population in total population is higher than that in the district. In Burda village, total residing household is 1067. In this village 13% of population belongs to scheduled castes and 27% of total population is scheduled tribes. In Purulia district 64 % of population aged six plus year can read and write while in Baghmundi and Burda village 58% of the population is literate.

**Table-1. Demographic Profile of the Study Area**

<b>Area</b>	<b>No. of residing households</b>	<b>SC (%)</b>	<b>ST (%)</b>	<b>Literacy rate (%)</b>
Purulia District	567824	19.37	18.45	64.48
Baghmundi Block	27508	10.35	25.10	57.17
Burda Village	1067	13.16	26.59	57.87

Source: Population Census in India, 2011

**Table-2 Living Standard of the households in Study Area**

Area	Dirt wall house (%)	Drinking water from unsafe source (%)	No. access to electricity for lighting source (%)	No. access to improved sanitation (%)	No. access to improved fuel for cooking (%)	Hou- seholds having no Census asset (%)
Purulia District	16.3	32.3	65.7	88.2	94.5	23.4
Baghmundi Block	1.7	54	77.1	91.3	98.4	27.3
Burda village	80.7	69.3	83.9	90.8	96.5	42.9

Source: Population Census in India, 2011

In Purulia district 16.3% households live in dirt wall house. Only 32.3% households in Purulia district used unsaved drinking water. It is not surprising that two third of the households in Purulia district do not have access to electricity for lighting. We observed that, in Purulia district the problem of no access to improved sanitation (88.2%) is severe. In this district use of dirty fuel for cooking is common problem. However, in terms of asset, only 23.4% of the households in Purulia district do not have census asset. In Baghmundi block only 1.7% households live in dirt wall house. 54% households in Baghmundi block use unsafe source for drinking water. The problem of no access to improved sanitation (91.3%) is more serious in Baghmundi block compared to the district as whole. In this block most of the households use dirty fuel like cow dung cake, fire wood, crop residue etc for cooking. In this block 27.3% of the households do not have Census asset.

In Burda village, 80.7% households live in dirt wall house. In this village 69.3% households use unsafe source for drinking water like well, spring, untreated piped water and 83.9% households have no electricity for lighting. It is reported that most of the households in this village have no sanitation and access to improved fuel for cooking. As per census report 42.9% households are asset poor. Most of the households in this village earn their livelihood from backward agriculture activities and selling physical labour.

## Data Source and Methodology

The study is based on a household survey conducted in Burda village, Purulia district during 2014-2015. We have collected data from 120 households belonging to different social groups like SC, ST, OBC and General Castes. It should be noted that sample households from these different social groups have varied with total inhabitant and other socio economic characteristics of the groups. Therefore, sampling for this study may be looked as a mixture of stratified random and purposive sampling. In this study, the relevant information of 120 households has been considered for empirical analysis. Our sample includes 20 SC households, 39 ST households, 50 OBC households and 11 GEN households.

In order to measure MPI for the sample households this study follows the methodology proposed by Alkire and Santos (2010) which covers the overlapping deprivation across the field of health, education and standard of living. We have considered ten indicators in total for capturing the deprivation in the array of three dimension viz. health, education and standard of living. These three dimensions and ten indicators of multidimensional poverty with deprivation criteria and weights have been presented in table-3<sup>6</sup>. Only to avoid the problem relating to measuring malnutrition we replace the indicator of malnutrition by hunger. If any household member faces the acute shortage of food i.e. square meal a day, at any time during last two years we treat the household facing hunger. In living standard dimension we have considered whether the household has land ownership in place of the indicator dirt wall. For other indicators we simply gather the required information asking the respondents and from our observations.

Equal weight has attached for each dimension and each dimension within a dimension has also got equal weight. We assign value '1' for deprivation and '0' otherwise. Thus maximum deprivation score (d) will be 10. The maximum deprivation score in each dimension is  $10/3$  since the MPI puts equal weight for each dimension. Since the dimension of health has two indicators each indicator with deprivation in the health dimension is worth  $5/3$ . Similarly, each indicator of education dimension of deprivation takes score  $5/3$ . The standard of living dimension has six component indicators hence

each indicator with deprivation carries score 5/9. Now to measure the deprivation level of a household we take the summation of the score (weighted deprivation score) obtained by the household in the range of all the dimensions and indicators. A household (or all members of the household) is said to be multi-dimensionally poor, according to UNDP if the sum of weighted deprivation score (WDS) for a household is 3 or more.

**Table-3 Dimension and indicators of Multidimensional Poverty**

Dimension	Indicators	Weight
Health	4.1.1.1.1. 1) At least one member suffers from hunger during last five years	4.1.1.1.3. 5/3
	4.1.1.1.2. 2) One or more child have died during last five years	4.1.1.1.4. 5/3
Education	5.1.1.1.1. 1) No one has completed five years of schooling	5.1.1.1. 3. 5/3
	5.1.1.1.2. 2) At least one school-age child not enrolled in school	5.1.1.1. 4. 5/3
Living Condition	6.1.1.1.1. 1) No electricity	6.1.1.1.7. 5/9
	6.1.1.1.2. 2) No access to safe drinking water	6.1.1.1.8. 5/9
	6.1.1.1.3. 3) No access to improved sanitation	6.1.1.1.9. 5/9
	6.1.1.1.4. 4) Household without ownership of land	6.1.1.1.10. 5/9
	6.1.1.1.5. 5) Household uses dirty cooking fuel (dung, firewood or charcoal)	6.1.1.1.11. 5/9
	6.1.1.1.6. 6) Household has no bicycle.	6.1.1.1.12. 5/9

Source: Compiled from UNDP Human Development Report, 2010 and own justification

The multi-dimensional poverty head count ratio (H) is the proportion of the multi-dimensionally poor people to the total population.

Therefore,

$$H=q/n$$

where, q stands for the number of multi-dimensionally poor households and n is the total sample households. It basically measures the incidence of poverty. The intensity of multi-dimensional poverty

(A) reflects the proportion of the weighted component indicators, in which, on average, poor people are deprived of.

Technically,

$$A = \frac{c}{qd}$$

where,  $c$  denotes the total score of weighted deprivations the poor people experience and  $d$  is the total number of indicators in all the dimensions of deprivation.

The multi-dimensional poverty index is obtained by multiplying the multi-dimensionally poverty head count ratio (H) with the intensity of multi-dimensional poverty (A).

Thus,  $MPI = H \times A$

In accordance with the sum of weighted deprivation score (WDS) this study has ordered the extent of multidimensional poverty in four different classes. If  $0 \leq WDS \leq 2$  for a household we treat it as well off class. The households having  $2 < WDS \leq 3$  have been considered as vulnerable of multidimensional poverty. The households with  $3 < WDS \leq 5$  are belonging to marginally poor class. Finally, we have identified the households as extreme poor who have

$$5 < WDS \leq 10 \cdot$$

### **Empirical Findings and Discussion**

We will analysis the empirical finding in this section. Table-4 gives the summary statistics of the indicators of multidimensional poverty for the sample households. In our sample survey, we have found that no member in any of the sample households has suffered from hunger during the last two years from the date of survey. It is also reported that no child has died during last five year for the sample households irrespective of the social groups. It indicates that there is no health poverty in accordance with the measurement under consideration. However, most of the villagers reports that they have to access to formal health facility. They depend on local non-qualified doctors or healers.

**Table-4 Description of the Indicators of Multidimensional Poverty**

<b>Dimension/Indicator</b>	<b>Total Household Number</b>	<b>SC Household Number</b>	<b>ST Household Number</b>	<b>OBC Household Number</b>
	<b>(%)</b>	<b>(%)</b>	<b>(%)</b>	<b>(%)</b>
<b>Health</b>				
At least one member is malnourished	0(0)	0(0)	0(0)	0(0)
One or more child have died during last five years	0(0)	0(0)	0(0)	0(0)
<b>Education</b>				
No one has completed five years of schooling	44(36)	17(85)	12(30)	13(26)
At least one school-age child not enrolled in school	25(20)	8(40)	10(25)	5(10)
<b>Living Condition</b>				
No electricity	75(62.5)	9(45)	32(82)	28(56)
No access to safe drinking water	57(47.5)	0(0)	10(25)	40(80)
Household uses dirty cooking fuel(dung, firewood or charcoal)	117(97)	20(100)	39(100)	48(96)
Household without ownership of land	48(40)	4(20)	24(61.5)	15(30)
Household has no bicycle	35(29)	5(25)	13(33)	12(24)
No access to improved sanitation	101(84.16)	20(100)	32(82)	41(82)
Sample Size(% of total households of village)	120(11.25)	20(2.94)	39(2.84)	50 (NA)

Source: Own sample survey, 2015

Around 36% of the sample households in which none of the members has passed primary level education. However, these figures are different among SC, ST and OBC households. In our sample survey, 85% of SC (30% of ST) households have no member who has passed primary level education. Among the OBC households 26 % households don't have primary level passed member. Therefore, we



have observed that deprivation of education is more serious among the SC community compared to ST community in our study village. In spite of the commendable expansion of educational infrastructure in West Bengal we find many households where at least one child (up to 14 years) of households does not enrol in educational institutions. In our sample survey, 20% of households have at least one child who has not enrolled in educational institutions at the time of survey. In respect of education SC and ST households in our sample village are suffering from deprivation.

It has been found that, 62.5% of the sample sample households are not electrified. Among the ST households 82% are not electrified. In other hand, 45% of SC households and 56% of OBC are not electrified. In this survey 47.5% of the surveyed households drink water form unsafe source. In this village we find that no one SC household drink water from unsafe source. Most of the SC households have tube well for drinking water. However, among the OBC households 80% drink water from unsafe source like uncovered well. One fourth of ST households use unsafe source of drinking water. It is not surprising that 97% of the surveyed households use dirty fuel like dung, firewood or charcoal for cooking. This figure is 100% for both the groups' households SC and ST and 96% for OBC households. It indicates that households in the area under study have hardly access to modern fuel and energy for cooking. In Burda 40% households have no landholding - 20% of SC households have no land, 61.5% of ST households and 30% of OBC households do not have land ownership. We find that land holding condition of the ST household is not so good. We have observed that majority of the sample households are asset poor. In our sample survey we find that 29% of sample household has no bicycle. In case of SC household are 25% SC household has no bicycle and ST households 33% has no bicycle. For OBC household, this figure is 24%. This picture will be more acute if we consider the other census assets.

Our survey has reported that 84.16% of the sample households do not have access to improved sanitation. In case of SC household 100% household are do not have access to improved sanitation. It tells us that the sample households in the Burda village, Purulia district are not conscious regarding health and hygiene. The description of the indicators, therefore, shows that majority of SC, ST and OBC

households in the sample village of Purulia are poor in terms of education and standard of living.

Table-5 and table-6 present the nature of multidimensional poverty and income poverty along with the socio-economic profile of the sample households. Based on the criteria of identifying multi-dimensionally poor we have found that 41.66% of our sample households are multi-dimensionally poor. Among the SC households 65% households are multi-dimensionally poor. However, only 43% of ST households are multi-dimensionally poor. For OBC household this figure is only 32%. Therefore, multi-dimensional poverty is more serious among the SC community compared to ST and OBC community in our study village. We have also computed poverty head count ratio for the sample households. It has been found that 44.16% of the sample households are income poor in accordance with the poverty line income (Rs. 643 per head per month) for rural in West Bengal (Government of India, 2012). In case of SC household 25% household are income poor and for ST household 41.02% household are income poor. Moreover, half of the sample OBC households are income poor. Therefore, we observed that income poverty is more serious for OBC households compared to ST and SC household in our study village.

**Table-5 Percentage Distribution of the Attributes of Sample Households**

Selected Attributes of the Households	Total	SC	ST	OBC
	Hou- seholds	Hou- seholds	Hou- seholds	Households
	Number (%)	Number (%)	Number (%)	Number (%)
Multidimensional poor	50(41.66)	13(65)	17(43)	16(32)
Income poor	53(44.16)	5(25)	16(41.02)	25(50)
Landless households	48(40)	4(20)	24(61.5)	15(30)
Participation in MGN-REGS	92 (76.66)	14 (70)	29 (74)	41(82)
Participation in SHG	52(43.33)	12 (60)	19 (48)	20 (40)

Cultivation as Major Occupation	36 (30)	0 (0)	6 (15)	22 (44)
Nonfarm Self Employment as Major Occupation	9 (7.5)	1 (5)	1 (2.5)	7 (14)
Service as Major Occupation	0 (0)	0 (0)	0 (0)	0 (0)
Casual Labour as Major Occupation	91(75.83)	90 (95)	32 (82.05)	32 (64)
Nuclear family	120 (100)	20 (100)	39 (100)	50 (100)

Source: Own sample survey, 2015

This study reveals that the MGNREGS and SGSY programs are functioning to serve the poor in Burda village. It is reported that 76.66% of the sample households have job-card under MGNREGA. Thus, more than three-fourth of our sample households have participated in MGNREGA programme. In case of the SC households 70% have job-card under MGNREGA and 74% of ST households have job-card under MGNREGA. The participation in MGNREGA of the OBC households in this village is commendable. There is no significant different among ST, SC and OBC households regarding the participation in MGNREGA. On the other hand 43.33% of the sample households have participated in SHG-centric microfinance programme. It is reported that 60% of SC households, 48% of ST households and 40% of OBC households have a SHG member. Therefore, we have seen that SC households compared to other social groups are more likely to participate in SHG programme. Among the sample households majority earn their livelihood being casual labour. No one of the sample household member earns from formal service. A handful of persons in this village earn livelihood from informal teaching of music and academics or proving health services. One third of the sample households earn from cultivation. However, no SC household earn from cultivation while 44% of OBC households are engaged in cultivation. Only 15% of ST households earn from cultivation. In our sample survey we find all the households are nuclear family. Actually in the village two or three households are living jointly. We do not survey them. The average family size of the sample households is 3.95. Most of sample household comprises the 4 persons.

**Table-6 Descriptive Statistics of the households Characteristics (N= 120)**

Households Characteristics	Mean	Median	Std. Dev	C.V
Family size	3.95	4	0.960	0.243
Weighted Deprivation Score of the Households	2.962	2.777	1.428	0.482
Duration of participation in SHG (year)	2.5	2	2.553	1.287
Duration of participation in NREGA (days)	28.966	21	33.694	1.163
Monthly Per Capita Income (Rs.)	839.68	833.33	236.78	0.2819

Source: Own sample survey, 2015

In table-6 we see the descriptive statistics of the quantitative variables of the sample households. We find that average of Weighted Deprivation Score for the sample households is 2.96 which vary widely as denoted by CV (48.2%). It indicates that in average the sample households are multi-dimensionally marginal poor.

In the above section we have seen that a large number of households participate in SHG-centric microfinance program for getting financial assistant from financial institutions. But a few groups get formal financial assistance. Average duration participation in SHG is two years. On the other hand, at least one member of a large number of household have got NREGA card for getting secure job with a standard wage. However, the average duration work provided under this program is 30-40 days in a year. The average per capita monthly income is 839.68, which varies with C.V 0.28.

**Table.7 Extent of Multidimensional Poverty among the Sample Households**

Weighted Deprivation Score (WDS)	Extent of Multidimensional Poverty	Total Households Number (%)	SC Households Number (%)	ST Households Number (%)	OBC Households Number (%)
5<WDS≤10	Extreme poor	8(6.66)	1(1)	4(10.25)	3(6)
3<WDS≤5	Marginal Poor	42(35)	12(60)	13(33.33)	13(26)
2<WDS≤3	Vulnerable (Non-poor)	40(33.33)	5(25)	13(33.33)	18(36)
0<WDS≤2	Well-off (Non-poor)	30(25)	2(10)	9(23.07)	16(32)

Source: Own sample survey, 2015

In our sample survey we find that 6.66% of household are extremely poor. In this sample 1% of SC household, 10.25% of ST household and 3% of OBC household are extremely poor. Therefore, we have observed that ST households are more likely to be extreme multi-dimensionally poor. It has been found that 35% of household are marginal poor. More SC households than other ST and OBC households are marginally poor. One third of the sample households are vulnerable or non poor. We find that 25% of the sample households are well-off in respect of the indicators of multidimensional poverty.

**Table 8 Multidimensional Poverty Index of the sample Households**

Index	All sample households	SC household	ST household	OBC household
MPI	0.441	0.536	0.451	0.136

Source: Own sample survey, 2015

In table-8, we find that MPI of all sample households is 0.441. The MPI of SC household is 0.536. The value of MPI for the ST households is 0.451 and it is 0.136 for OBC households. Therefore, the extent of multidimensional poverty for the SC households is higher than the extent of multidimensional poverty for the ST households and OBC households.

## Conclusion

The MPI helps to identify the poor and design policies to address the interlocking deprivations of the poor households. In this study we have measured the multidimensional income poverty and MPI for the village as a whole and an attempt has been taken to measure the MPI for SC ST and OBC households separately. This study reveals that the extent of multidimensional poverty for the SC households is higher than the extent of multidimensional poverty for the ST households and OBC households and the income poverty of households in the village of Burda of Purulia is serious problem than the multidimensional poverty. Income generation, no doubt, has some accelerating effect on reducing multidimensional poverty. In addition to income generation, we need to ensure the accessibility to other improved facilities like health care, safe drinking water, education, affordable housing, and

sanitation that directly fight against multidimensional poverty for the socially backward people belonging to SC, ST and OBC in the village of Burda, Baghmundi Purulia.

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