ODISHA ECONOMIC JOURNAL

(Formerly Orissa Economic Journal)

Journal of the
Orissa Economics Association

Bhubaneswar

http://odishaeconomicjournal.in/

Contents

Editorial

This issue of the *Odisha Economic Journal* has a larger focus on the tribal and rural economy of Odisha. A few articles were also presented at the 54th Annual Conference of the OEA. Starting with the discussions on the highly marginalised indigenous groups, the Presidential Address (by S. N. Tripathy) brings to the fore challenges of livelihood and poverty facing certain Particularly Vulnerable Tribal Groups (PVTGs) in the state. The household-level enquiries unravel layers of deprivation and policy neglect including loss of local natural resources.

The second article (by Jyoti Rekha Purohit and Himanshu Sekhar Rout) addresses the implicit/indirect impacts of climate change on human health in the state. This is rather a less-researched subject and, unsurprisingly, Ms. Purohit received the *Professor Baidyanath Misra Best Paper Award* for this work at the 54th OEA Annual Conference. The potential disease burden induced by climate change, as the paper observes, included stroke typically in the age group of 40-45, malaria in children of 10-15 years and diarrhoeal ailments in infants. The paper makes a case for policy attention.

Focusing on the poverty and livelihood limits faced by certain disadvantaged social groups in two districts of western Odisha the paper (by Surendra Meher) underscores restricted access to profitable employment opportunities especially by the Scheduled Caste and Scheduled Tribe population often located in high poverty zones. Even the MGNREGA activities have largely discontinued here. The paper suggests improving physical infrastructure and investment in human capital formation are essential to move out of poverty and casual low-end work.

Enquiring into the possibility of doubling farmers' income in Odisha by 2022-23, the paper (by Amit Kumar Basantaray), drawing upon the NSSO 70th and 77th rounds of survey data, brings out a set of challenges including proliferation of marginal and small landholdings and a rise in indebtedness amongst farming households. That these structural constraints would hold back a major improvement in farmers' income emerges clear from the analysis.

The paper (by Manas Kumar Behera and Mitali Chinara) also focuses on rural employment crisis highlighting roadblocks in women's participation in multiple pre- and post-harvest activities in agriculture and allied activities. Despite significant contribution and hard work their ownership right over land has not been formally recognised. This acts as a deterrent to their unbound entrepreneurial potential.

The research note (by Mrityunjay Pandey and R. Vijay) exposits recent changes in policy reform in tenancy with reference to diverse experiences in Odisha and Telangana to point out how state could make

a difference in addressing the agrarian crisis. It analyses the if the policy shift has sorted the crisis of the most distressed farmer, namely, the landless tenant cultivator. Changes in policy, the paper shows, would also impact rural land market in the long run.

This issue includes an interesting paper (by Parimal Ghosh, Abhishek Dutta and Maniklal Adhikary) providing a theoretical critique of the Okun's Law. Basing their analysis of GDP data for the period 2015-22 – marked by major events as demonetization, introduction of Goods and Services Tax, and the pandemic – they conclude that both GDP and unemployment are level stationary and there exists unidirectional causality from GDP to unemployment. This paper bagged the *Professor Prasanta Pattanaik Best Paper Award* for Parimal Ghosh.

The book review (by Soumik Sarkar) takes up an absorbing volume titled *Capitalism and the Sea: The Maritime Factor in the Making of the Modern World* and provides a window into the maritime factor shaping global capitalism. Not just economic gain, but the sea also interfaced with ecological and geopolitical aspects as capitalism advanced.

As one more issue of the *Odisha Economic Journal* is brought to the readers, we remain steadfast in our commitment to enhance the quality of papers. With discerning and competent referees supporting us in our venture, we are faced with the growing challenge of the high rejection of manuscripts. At times, this has prompted dejected authors to hold the Executive Editor (who formally conveys the unpleasant message) and even the editorial process responsible for the loss of a perceived opportunity. We can only assure everyone that referees' comments and suggestions remain the most crucial quality check and the Executive Editor goes by that without a waiver. Suggestions for improvement of the journal by readers and contributors are always most welcome in this small but important journey of ours.

Keshab Das
Executive Editor

Referees

OEJ expresses sincere gratitude to the following experts for their comments, suggestions and recommendations on draft papers.

Saumya Chakrabarti, Visva Bharati, Santiniketan
Mitali Chinara, Utkal University, Bhubaneswar
Keshab Das, Gujarat Institute of Development Research, Ahmedabad
Pratap Ranjan Jena, National Institute of Public Finance and Policy, New Delhi
Amalendu Jyotishi, Azim Premji University, Bangalore
Bikash R. Mishra, National Institute of Technology, Rourkela
Deepak Kumar Mishra, Jawaharlal Nehru University, New Delhi
Srijit Mishra, Indira Gandhi Institute of Development Research, Mumbai
Arup Mitra, Institute of Economic Growth, Delhi
Udaya Shankar Mishra, Centre for Development Studies, Thiruvananthapuram
Bibhu Prasad Naik, Tata Institute of Social Sciences, Mumbai
D. Narayana, Gulati Institute of Finance and Taxation, Thiruvananthapuram
Balakrushna Padhi, BITS, Pilani
Unmesh Patnaik, Tata Institute of Social Sciences, Mumbai
Itishree Pattnaik, Gujarat Institute of Development Research, Ahmedabad
Badrinarayan Rath, Indian Institute of Technology, Hyderabad
Y.V.R. Reddy, Goa University, Goa
Hastimal Sagara, GLS University, Ahmedabad
Madhuri Saripalle, Krea University, Chittoor

Dynamics of Social Inclusion of Particularly Vulnerable Tribal Groups (PVTGs) in Odisha: Evidence from Three Districts

S N Tripathy

I feel honoured to address you today as the President of the Orissa Economics Association (OEA) at its 54th Annual Conference organised under the patronage of Gangadhar Meher University, Sambalpur, Odisha. I express sincere thanks to all the members of the OEA for electing me to this position.

My discussion is presented in four sections. Section 1 deals with the introduction and the demographic features of PVTGs. Section 2 highlights inclusion of PVTGs to the mainstream of development, objectives, and methodology of the study. Section 3 presents the comprehensive analysis pertaining to social inclusion of selected PVTGs, namely, Didayi, Kutia Kandha and Juanga, selected from three districts of Odisha. Section 4 presents the conclusion and suggestions of the study.

S. N. Tripathy, Former Professor of Economics, Gokhale Institute of Politics and Economics, Deemed University, Pune. Currently at 4th Bijoy Bihar, Berhampur, Odisha.Email: sn_tripathy2004@yahoo.com

Section 1

Introduction:

The tribal population of India, as per 2011 Census, is 10.43 crore, constituting 8.6 per cent of the total population out of which 89.97 per cent live in rural areas and 10.03 per cent in urban areas (*Statistical Profile of STs 2013*: 1). Odisha has 62 culturally vibrant tribes including 13 primitive tribal groups, who are found spread all over the state. Across the Eastern Ghats lies the hinterland of Odisha, the home of ancient tribes in an ethnic succession.

There are some groups known as the Particularly Vulnerable Tribal Groups (PVTGs) characterized by homogenous groups with small population, physically isolated, low literacy level, adopting simple technology with stagnant or diminishing population and are the less developed and more vulnerable among the Scheduled Tribes. Dhebar Commission (1962) outlined the PVTGs as a class of tribals in an extremely underdeveloped state occupying the lowest layer and suggested for their special protection and development. More than 80 per cent population of PVTGs inhabit Madhya Pradesh, Odisha, Andhra Pradesh, Maharashtra, Jharkhand, Tamil Nadu, Tripura and Chhattisgarh. The PVTGs living in interior pockets and inaccessible places are becoming vulnerable to hunger/starvation, malnutrition and lack of educational and economic progress and are having low health indices.

Out of the 75 PVTGs identified in India, 13 are in Odisha, namely, Bonda, Birhor, Chuktia Bhunjia, Dangria Kandha, Didayi, Hill-Kharia, Juanga, Kutia-Kandha, Lodha, Lanjia Saora, Mankirdia, Paudi Bhuyan and Saora. In accordance with the instruction of the Government of India, 17 Micro Project Agencies (MPAs) have been established in Odisha during the period 1976-77 to 1994-95 in phases for providing special attention for their all-round development (Table 1). These Micro Projects are in 12 districts (Malkanagiri, Rayagada, Angul, Deogarh, Ganjam, Nuapada, Keojhar, Sundergarh, Gajapati, Kandhamal, Kalahandi and Mayurbhanj) spread over 20 blocks, 84 gram panchayats covering 1019 villages of the state. The Government of Odisha announced inclusion of 888 left out villages in the list of PVTGs (Government of Odisha & SC Development Department, Bhubaneswar, June 9, 2020)[1].

Table 2 reveals the number of households and population of PVTGs in Odisha inhabiting in 17 micro project areas. The total population of 13 PVTGs is 1,34,311. It is found that among the PVTGs Kutia Kandhas have the highest number of households (16661), followed by Lanjia Saoras in Gajapati District (2923) whereas the Hill Kharias and Mankirdias of Jashipur, Mayurbhanj district have the lowest number of households (682) followed by Dongria Kandhas of Parsali in Rayagada District (730). The lowest proportion of male population is found in

Dongria Kandhas of Parsali, in Rayagada (42.47 %), followed by the same community in Kurli, in Rayagada district (45.86 %) and Bondo PVTG of Mudulipada in Malkangiri District (46.42 %). The highest per cent of female population is found in Dongria Kandhas of Parsali in Rayagada District (57.53 %), followed by the same community in Kurli, in Rayagada district (54.14 %) and Bondo PVTG of Mudulipada in Malkangiri District (53.48 %).

Table 1: Table Identification of PVTGs in Orissa during Different Plan Periods

Plan Period	Year	PVTGS
5th Five Year Plan	1974-79	Bonda
Plan Holiday	1979-80	Birhor, Dongria Khond, Juang, Kutia Khond, Lanjia saora, Paudi Bhuyan and Saora
7th Five Year Plan	1985-90	Lodha, Mankirdia, Hill Kharia, Didayi
8th Five Year Plan	1992-97	Chuktia Bhunjia

Table 2: Number of Households and Population of PVTGs in Odisha

Name and location of micro project areas	Number of households	Population		
		Male	Female	Total
Bondo Development Agency (BDA): Mudulipada, Malkangiri District	2365	6103 (46.42)	7045 (53.48)	13148 (100.00)
Chuktia Bhunjia Development Agency (CBDA): Sonabeda, Komna, Nuapada District	831	1721 (48.93)	1806 (51.07)	3527 (100.00)
Didayi Development Agency (DDA): Kudumuluguma, Malkangiri District	1907	5148 (48.80)	5402 (51.20)	10550 (100.00)
Dongria Kandha Development Agency (DKDA): Kurli, Bissam-Cuttack, Rayagada District	1853	3353 (45.86)	3958 (54.14)	7311 (100.00)
Dongria Kandha Development Agency (DKDA): Parsali, Kalyansingpur, Rayagada District	730	1196 (42.47)	1620 (57.53)	2816 (100.00)
Juanga Development Agency (JDA): Gonasika, Keonjhar District	2583	8924 (49.99)	8928 (50.01)	17852 (100.00)
Hill Kharia and Mankirdia Development Agency	682	1630 (50.67)	1587 (49.33)	3217 (100.00)

(H.K & M.D.A.) Jashipur, Mayurbhanj District				
Kutia Kandha Development Agency (KKDA): Belghar, Kandhamal District	16661	4166 (48.09)	4496 (51.91)	8662 (100.00)
Kutia Kandha Development Agency (KKDA): Lanjigarh, Kalahandi District	930	1809 (50.99)	1739 (49.01)	3548 (100.00)
Lanjia Saora Development Agency (LSDA): Serango, Gajapati District	2923	6418 (48.54)	6804 (51.46)	13222 (100.00)
Lanjia Saora Development Agency (LSDA): Puttasing, Gunupur, Rayagada District	1301	3261 (48.14)	3513 (51.86)	6774 (100.00)
Lodha Development Agency (LDA): Morada, Mayurbhanj District	1232	2513 (49.44)	2570 (50.56)	5083 (100.00)
Paudi Bhuyan Development Agency (PBDA): Jamardihi (Pallahara), Angul District	1376	2793 (49.19)	2885 (50.81)	5678 (100.00)
Paudi Bhuyan Development Agency (PBDA): Khuntgaon, Sundargarh District	1842	5363 (49.33)	5508 (50.77)	10871 (100.00)
Paudi Bhuyan Development Agency (PBDA): Rugudakudar, Barkote, Deogarh District	1110	1992 (50.49)	1953 (49.51)	3945 (100.00)
Saora Development Agency (SDA): Thumba, Patrapur, Ganjam District	1314	3238 (49.23)	3339 (50.77)	6577 (100.00)
Saora Development Agency (SDA): Chandagiri, Gajapati District	2668	6059 (52.55)	5471 (47.45)	11530 (100.00)
!7 Micro Projects	42008	65687 (48.91)	68624 (51.09)	134311 (100.00)

Source: SCSTRTI, 2018
Note: Figures in parentheses are percentatges.

Table 3 shows the population of PVTGs in Odisha as per the 2011 Census. It is revealed that the Saura tribe constitutes the highest number of population (534751), followed by Kharia PVTG (222844).

Table 3: Population of PVTGs in Odisha, 2011

PVTGs	Population	PVTGs	Population	PVTGs	Population
Chuktia Bhunjia	2378	Juanga	47095	Mankirdia	2222
Birhor	596	Kharia	222844	Paudi Bhuyan	5788
Bondo	12231	Kutia Khond	7232	Saura	534751
Didayi	8890	Lanjia Saura	5960		
Dongria Khond	6306	Lodha	9785		

Source: Statistical Profile of Scheduled Tribes in India 2013, p. 206.

Table 4 depicts the literacy rate of 13 PVTGs in Odisha inhabiting in 17 micro project areas. It is found that the female literacy among the Didayi PVTG is the lowest (2.99 %), followed by Bondo (4.7 %) whereas the Saora PVTG of Chandragiri has the highest female literacy of 26.88 per cent. The overall PVTGs female literacy is abysmally low. The literacy rate among males was the lowest among the Didayis (12.4 %), followed by Bondos (17.15 %). The Saora PVTG of Chandragiri in Gajapati district has the highest male literacy of 60.96 per cent.

Table 4: Literacy Rate of 13 PVTGs in Odisha Inhabiting in 17 Micro Project Areas

(Percentages)

Name of PVTGs	Total	Male	Female
Bondo	10.33	17.15	4.70
Chuktia Bhunjia	18.77	28.55	9.17
Didayi	7.36	12.34	2.99
Dongria Kandha, Kurli,	16.23	30.27	6.02
Dongria Kandha, Parsali	14.40	22.72	6.08
Juanga	24.12	36.66	11.96
Hill Kharia, Birhor, Mankirdia	30.45	41.63	19.45
Kutia Kandha, Belghar	25.83	37.96	14.58
Kutia Kandha, Lanjigarh	32.56	44.64	20.22
Lanjia Saora, Serango	29.54	35.23	19.15
Lanjia Saora, Puttasing	32.99	41.00	25.33
Lodha	23.41	29.32	17.08
Paudi Bhuyan, Jamardihi	34.68	46.25	23.11
Paudi Bhuyan, Khuntgaon	19.23	25.88	12.58
Paudi Bhuyan, Rugudakudar	20.41	22.51	18.32
Saora, Chandagiri	44.00	60.96	26.88
Saora, Thumba	26.32	40.65	15.92

Source: SCSTRTI, (2001)

<center>**Section 2**</center>

Social Inclusion and Inclusive Policy

In the light of the above basic demographic information, it can be inferred that it is high time to adopt policy measures for the inclusion of PVTGs into the mainstream of development. The policy of economic empowerment is expected to enhance the capacities of deprived groups like PVTGs, to take advantage of the ongoing social and economic progress.

Growth is inclusive when it creates economic opportunities along with ensuring equal access to the PVTGs. Apart from addressing the issue of inequality, inclusive growth may also make the poverty reduction efforts more effective by explicitly creating productive economic opportunities for the poor PVTGs and vulnerable sections of the society. Thus, social inclusion is a process of improving the capability, prospects, and dignity of poor vulnerable tribes. These spheres of inclusion encompass employment and work, income and economic resources, material resources, education and skills, health, housing, social resources, community resources, and personal safety.

Objectives of the Study

In the light of the above backdrop, the present study has the following objectives.

i.   To portray briefly about the Didayi tribe of Malkangiri district, Juangas of Keonjhar district and Kutia Kondhas of Kandhamal district of Odisha.

ii. To examine the extent of social inclusion based on employment and work, income and economic resources, material resources, education, skills, reproductive, maternal, newborn and child health, housing, social resources, community resources, personal safety, and financial inclusion of three selected PVTGs covering the three districts of Odisha.

Methodology of the Study

The target population for the study is confined to the following three PVTGs: The Didayi Development Agency (DDA) Kudumulgumma block in Malkangiri district; the Juanga Development Agency (JDA) Banspal block of Keonjhar district; and the Kutia Kondha Development Agency (KKDA) Tumudibandh block of the Baliguda subdivision in Kandhamal district. The study is based on primary sources of data accumulated through brief interviews with PVTGs. From each identified district, the list of project beneficiaries is obtained from the concerned agencies for selection of households. To explore the

perceptible socio-economic changes leading to social inclusion that has taken place because of different interventions, 305 households of 19 villages under four blocks were selected randomly from the beneficiaries list obtained from the respective micro project agencies. The details of gram panchayats, villages and households covered in the study are shown in Annexure 1. The study has been supplemented by participant observation and secondary sources of data collected from various books, reports, and published material. For the present study, household is taken as the unit of enquiry.

Didayis as a PVTG

Like Saharias of Madhya Pradesh and Chenchus of Andhra Pradesh, Didayi is one of the PVTGs found in the hilly terrains mainly concentrated in Kudumuluguma and Khairiput block of Malkangiri district of Odisha. Didayi is one of the most deprived, economically backward, and vulnerable tribes with low level of education, pre-agricultural technology, and insecure/ declining livelihood opportunity. They have been surviving amidst ecological and geophysical hazards and socio-economic impediments and backwardness. In course of time, they develop appropriate coping mechanisms to eke out their living under peculiar and disadvantageous situations. The Government of India provides cent per cent special grants for the all-round development of the tribal communities through operationalisation of micro projects. The Didayi Development Agency (DDA), one such micro project, with its headquarters at Kudumulugumma in Malkangiri district was established in August 1986 and subsequently in October 1986 it was registered under the Societies Registration Act, 1860 as an autonomous body. Didayi communities reside in 37 villages located in three distinctly marked sub-areas of Malkangiri district of Odisha. Didayi population numbered 3055 in 1971 increased to 5471 in 1991, to 7371 in 2001 and finally to 8890 in 2011 (GoI, *Statistical Profile of STs 2013*, Ministry of Tribal Affairs, p. 206).

Kutia Kondhas as a PVTG

The Kandhas, the chief inhabitants Kandhamal districts of Odisha, are divided into three classes, viz., the Kutia, Dongaria, and Desia (all in the Scheduled Tribes list and Kutia and Dongaria listed among the PVTGs. The Kutia Kondhas languishing in very fragile conditions of poverty and deprivation, more vulnerable to food insecurity, health problems and malnutrition are found largely in Kotagarh, Tumudibandh and Belghar blocks of the Baliguda subdivision in Kandhamal district. They collect various non-timber forest produce (NTFP) items such as honey, gum, gooseberry, bamboo, shrubs, fuel wood, dry leaves, nuts, sprouts wax, medicinal plants, roots, and tubes.

The main occupations of Kutia Kondhas ar agriculture, horticulture, shifting cultivation, minor forest collections, livestock rearing, wage earning, small business, artisan work, etc. The Kutia Kondha Development Agency (KKDA) is located at Belghar in Kandahmal district with the objective of serving the poverty stricken marginalized primitive tribes through the implementation of diverse schemes like special central assistance for the development of infrastructure, income generating and educational development of the community. According to Baseline Survey 2015 the total population of Kutia Kondhs was 6332; out of which 3029 were males and 3303 were females (*Plan Odisha*, 2018).

Juangas as a PVTG

Juangas an aboriginal tribe are mostly found in Keonjhar district in north Odisha. Their settlements are scattered, hidden inside hills. The poverty stricken Juangas are targeted by the nearby villagers of the plain area. The Juangas encounter resistance from the non-Juanga for the use of common property resources and protection of their forests. The traditional use and exchange of forest resources like timber, bamboo and firewood have been disrupted. They are proficient in basket making and exchange baskets for salt, oil, food, money from the village traders which are in demand in nearby caste villages. With the declining forest resources and fragile ecosystem, Juangas engage mostly in agriculture and wage earning as a source of livelihood and in times of natural hazards they are prone to starvation. They are more vulnerable to food insecurity, health problems and malnutrition and their socio-economic and educational status is worse than that of other tribal communities.

To take care of special needs of Juanga tribes, a micro project called Juanga Development Agency (JDA) covering six gram panchayats and 35 villages of Panchayat Samiti, Banspal is functioning in Keonjhar district since 1978 with special allocation from the Government of India. The 2011 Census reveals that the total number of Juanga population was 47095, out of which 23093 are males and 24002 are females. The sex-ratio was 1039 (GoI, *Statistical Profile of STs 2013*, Ministry of Tribal Affairs, p. 158).

Section 3

Household Composition of Didayis, Kutia Kandhas and Juangas

The household composition is explained in terms of average family size, average number of male and female members in the family. As shown in Table 5, on an average there are about 4.3 members consisting of 2.2 male members and 2.0 female members per household considering all the communities. However, the household size is slightly higher among the Didayi community compared to Kutia Kandha and Juanga community. The average household size among the households of Kutia

Kandha, Juanga and Didayi communities is found to be 4.2, 4.0 and 4.7 members, respectively. Compared to female members, there is slightly higher incidence male members in all the PVTG categories covered in this study.

Table 5: Number of Members per Household

PVTG Category	Number of Sample households	Number of Persons			Number of persons / Household		
		Males	Females	Total	Males	Females	Total
Kutia Kandha	100	216	200	416	2.2	2.0	4.2
Juanga	100	216	183	399	2.2	1.8	4.0
Didayi	105	252	239	491	2.4	2.3	4.7
Total	305	684	622	1306	2.2	2.0	4.3

Employment and Work

Extent of social inclusion based on employment and work considers four important indicators as mentioned in Table 6. The dependency ratio, a demographic indicator gives insight into the number of people of non-working age, compared with the number of those of working age. It is normally used to understand the relative economic burden of the workforce. Compared to all India situation, the dependency ratio among all categories of PVTG households is found higher. While calculating the dependency ratio among the PVTG households, only the main occupation of household members is considered. As per social inclusion norm, it is generally observed that there should be less dependency ratio towards higher social inclusion. As there is higher dependency ratio among the PVTG households, so, based on dependency ratio criteria they are more socially excluded.

The other indicator is work participation rate. As per Census of India definition, the Work Participation Rate (WPR) is the percentage of total workers to the total population. The overall work participation among the male and female members of the PVTG households is found higher compared to that at the state level. The analysis suggests that PVTG households are excluded in terms of dependency ratio and more included in terms of work participation rate. This type of contrasting values from the two interrelated indicators is because PVTG households have diversity of occupations and from each occupation possibly they do not get optimum remuneration for which there is more work participation rate and higher dependency ratio.

Table 6: Extent of Social Inclusion Based on Employment and Work

Sl. No	Indicators	Performance of PVTG households compared to all Odisha situation			
		Kutia Kandha	Juanga	Didayi	All Odisha
1	Dependency Ratio (Number of dependents per 100 workers)	70.0	70.0	60.0	35.0
2	Work Participation rate among male members	71.3	71.3	65.1	56.11
3	Work Participation rate among female members	63.5	71.0	62.3	27.16
4	Overall work participation rate	67.5	71.2	63.7	41.79

Sources: For 'All Odisha' in the first row, NFHS-4 India 2015-16, Odisha, p. 2; and in the second, third and fourth rows, *Odisha Profile 2018*, p. 110.

Income and Economic Resources

The extent of social inclusion explained in terms of income and economic resources considers four types of indicators as annual household income per household, annual household expenditure per household, percentage of households undertaking institutional savings particularly through banks, and indebtedness from all sources.

It is found from Table 7 that the PVTG households under all categories have less annual income compared to all Odisha situation. The average annual household income at all Odisha level stands at Rs. 485000, which is just Rs. 28594.20 for Kutia Kandha households, Rs. 37670.30 for Juanga households and Rs. 63263.7 for Didayi households. Thus, based on annual household income, the PVTG households are less included. Regarding mean annual household expenditure, it is found that average consumption expenditure of Kutia Kandha households stands lower compared to the overall figure prevailing in the state. On the other hand, among the Juanga and Didayi households average annual consumption expenditure is very much higher relative to the overall state figure; they may be observing lots of annual festivals and spending lavishly on food and entertainment.

Based on households saving in banks, it is found that Kutia Kandha and Juanga households are less included compared to Didayi households and all Odisha situations. The annual loan outstanding of PVTG households is much less compared to all Odisha situations. Taking into the criteria of income and economic resources, Kutia Kandha and Juanga households are less included compared to Didayi households.

Table 7: Extent of Social Inclusion Based on Income and Economic Resources

Sl.	Indicators	Performance of PVTG households compared to All Odisha Situation			
		Kutia Kandha	Juanga	Didayi	All Odisha
1	Annual Household Income (Rs.)	28594.2	37670.3	63263.7	485000
2	Annual Household Expenditure (Rs.)	12808.00	16883.20	25254.2	13257.12
3	% of households undertake bank savings	31.0	41.0	60.0	55.6
4	Indebtedness/ Household (Rs.)	2794.1	5795.5	7812.5	26,000

Sources: For 'All Odisha' in the first row, *Debt and Investment in Odisha,* 2018; in the second row, *Level and Pattern of Consumer Expenditure of Odisha*, 2012; in the third row, NABARD, 2016, p. 23; and in the fourth row, Directorate of Economics and Statistics, Odisha, P.V.

Material Resources

The extent of social inclusion in the light of material resources is analysed based on four important indicators as revealed in Table 8. It is observed that the value of material assets per household for the PVTG households stands much less compared to the overall situation of the state. Similarly, proportionately a smaller number of PVTG households possess mobile phones, television, and motorcycles. It may be stated that based on material resources, the extent of social inclusion among the PVTG households is found lower.

Education and Skills

For analysing the social inclusion based on education and skills, literacy rate, only one indicator is considered. Census of India remarks literacy and level of education are basic indicators of the level of development

achieved by a society. Spread of literacy is largely associated with important traits of modern civilization such as modernization, urbanization, industrialization, communication, and commerce. Literacy forms an important input in overall development of individuals enabling them to comprehend their social, political and cultural environment better and respond to it appropriately. As it is indicated in Table 9, the literacy rate among all categories of PVTG households stands much lower compared to the overall state situation. As per 2011 Census figures, the overall literacy rate stood at 72.8 per cent which is 63.9 per cent among the Kutia Kandha households, 62.7 per cent among the Juanga households and 54.2 per cent among the Didayi households. Apparently, regarding education and skills, the PVTG households are comparatively less included.

Table 8: Extent of Social Inclusion Based on Material Resources

Sl.	Indicators	Performance of PVTG households compared to All Odisha Situation			
		Kutia Kandha	Juanga	Didayi	All Odisha
1	Value of Material Assets/ Household (Rs.)	54256.8	121431.5	94046.5	695000.0
2	% of households own mobile phones	43.0	58.0	36.2	78
3	% of households own Television	9.0	33.0	18.1	47.2
4	% of households own motorcycles	15.0	23.0	13.3	26.3

Sources: For 'All Odisha' in the first row, *Debt and Investment in Odisha*, 2018, p.i; in the second row, NFHS-4 India 2015-16, Odisha. p. 4; in the third row, https://en.wikipedia.org; and in the fourth row, NFHS-4 India 2015-16, Odisha, p. 37.

Table 9: Extent of Social Inclusion Based on Education and Skills

Indicator	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
Literacy Rate (%)	63.9	62.7	54.2	72.8

Source: For 'All Odisha', Census of india, 2011.

Reproductive, Maternal, New-born and Child Health (RMNCH)

Promotion of institutional delivery of the pregnant women and proper vaccination of children are two important indicators towards the promotion of RMNCH. Institutional delivery is linked to safe motherhood and vaccination promotes healthy children. It is in this background that these two indicators have solid bearing on inclusive

society. As per Table10, the overall institutional delivery of pregnant women is about 75.9 per cent in Odisha which is much lower among the PVTG households. Institutional delivery as a percentage to total delivery in the community among Kutia Kandha, Juanga and Didayi households is found to be 43.3 per cent, 58.5 per cent and 69.2 per cent, respectively. Didayi households are better included in terms of safe motherhood compared to Juanga and Kutia Kandha households. In the vaccination front also, Didayi households stand even better than all Odisha situations. Compared to 78.6 per cent households undertake vaccination of children in Odisha, about 82.9 per cent of Juanga households undertake proper vaccination. About 71.0 per cent of Kutia Kandha households and 76.0 per cent of Juanga households have undertaken proper vaccination of their children.

Table 10: Extent of Social Inclusion Based on Reproductive, Maternal, New-born and Child Health (RMNCH).

Indicators	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
Institutional delivery as % to total delivery in the community	43.3	58.5	69.2	75.9
% of households reported proper vaccination of their children	71.0	76.0	82.9	78.6

Sources: For 'All Odisha' in the first row, *Odisha Profile 2018*, p.147; in the second row, *Odisha Profile 2018*, p. 148.

Housing

With the objective of ensuring good quality housing especially to the marginalised sections of the community, the Government of India has special housing related approach in its policy focus. The broad elements of the approach to tackle the problem of housing the poor are: special programmes /targeted subsidy to the poor and vulnerable groups, loan assistance to governmental agencies /beneficiaries at below-market interest rate for housing and at normal rate for infrastructure through the Housing and Urban Development Corporation (HUDCO), creation of housing assets as part of employment and income generation programmes, promotion of cost-effective and eco-friendly building materials and technologies and creation of an enabling environment for private sector initiative.

Moreover, the Government of Odisha has undertaken a number of schemes as IAY, PMAY and Biju Pucca Ghar Yojana. With the objective of assessing social inclusion relating to housing, three indicators are considered (Table 11). It is observed that despite number of schemes, negligible proportion of PVTG households have access to pucca house.

Only 19 per cent of Didayi group households, 5 per cent of Juanga households and 6 per cent of Kutia Kandha households have pucca houses. Compared to the overall situation of pucca houses in Odisha, PVTG households are very less included. With respect to household toilet facility, it is found that Juanga households are very much socially included which is not demonstrated among the Kutia Kandha and Didayi households. In terms of electricity facility, Didayi households are socially included which is found lagging among the Kutia Kandha and Juanga households.

Table 11: Extent of Social Inclusion based on Housing

Indicators	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
% of households having pucca house	5.0	6.0	19.0	45.0
% of households having toilet facility in their houses	32.0	53.0	34.3	46.9
% of households having electricity facility in their houses	37.0	64.0	93.3	86.0

Sources: For 'All Odisha' in the first and third rows, NFHS-4 India 2015-16, Odisha. p.3; in the second row, *Odisha At a Glance 2016* p. 73.

Social Resources

Access to social resources is a part of the overall social inclusion agenda. Regular attendance of children of school going age in schools is a broad-based indicator usually considered as a dimension of human development index. Similarly, in recent years, the concept of Self-Help Groups (SHGs) among the women from vulnerable categories constitutes to be the much-discussed social capital in the context of social engineering behaviour for alleviating poverty among the weaker and vulnerable strata of the society. In this background for analysing social inclusion by access to social resources, two indicators are considered (Table 12). It is observed that the children of Kutia Kandha tribe are the least regular in attending school compared to Juanga households. The Didayi households are found the best socially included so far as regularity of sending their children to schools is concerned. As against 72.9 per cent all Odisha situation, the incidence of regularity of school attendance of children of Didayi households is better at 96.4 per cent. So far as membership in the SHG is concerned, the performance of all PVTG households is found lower compared to the overall situation prevailing in the state.

Community Resources

Community resources are a group of services and/ or assisted programme that are provided to the members of a community for free or at an affordable price. Each resource is made available to community members to help them become self-reliant and maintain their human rights and wellbeing (Olabode, 2013). The resources derived from the forest ecosystem meet multiple purpose for different subgroups of people. A number of studies point out that the situations having more common property resources, have better chances of increased income from livestock activity. Due to this purpose, the second indicator annual household income from livestock activities is considered. As it is observed from Table 13, for both indicators the PVTG households are less socially included compared to the overall situation prevailing in the state.

Table 12 Extent of Social Inclusion Based on Social Resources

Indicators	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
%of households having children under school going age regularly sending their children to schools.	20.0	38.9	96.4	2.9
% of households reporting that the women members of the household as members of SHG	68.0	63.0	74.3	87.5

Sources: For 'All Odisha' in the first row, NABARD 2016, p. 3; in the second row, Census of India, 2011 and SIDBI (2020).

Table 13: Extent of Social Inclusion Based on Community Resources

Indicators	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
Annual household income from the sale of MFP/ Household (Rs.)	2073.5	2073.4	7835.3	22829.00
Annual Household income from Livestock/ Household (Rs.)	780.8	1723.2	12254.7	15768.00

Sources: For 'All Odisha' in the first row, Das and Patra, 2021; in the second row, NSSO, 70th Round Survey results.

Personal Safety

The PVTG households most often encounter hazards in terms of loss of income and employment due to crop failure and consequently loss of access to food items. To overcome such challenges, there is provisioning of ration cards and different type of social security pensions provided by the public authorities. The social inclusion based on two selected personal safety indicators is discussed in Table 14.

It is revealed that in terms of ration cards, the PVTG households are sufficiently included as a larger number of households are provided with ration cards relative to the same at all Odisha level. Similarly, a higher number of Didayi households except Juanga and Kutia Kandha households have usage of different social security pension cards. Compared to 11.5 per cent of households have usage of social security pension cards, 11.0 per cent of Kutia Kandha households, 8.0 per cent of Juanga households and 19.1 per cent of Didayi households have usage of social security pension cards.

Table 14: Extent of Social Inclusion Based on Personal Safety

Indicators	Performance of PVTG households compared to All Odisha Situation			
	Kutia Kandha	Juanga	Didayi	All Odisha
% of households having ration cards.	97.0	94.0	96.2	77.0
% of households having usage of different Social Pension Schemes of the Government.	11.0	8.0	19.1	11.5

Sources: For 'All Odisha' in the first row, Food Supplies and Consumer Welfare Department, Govt. of Odisha; in the second row, The Social Security and Empowerment of Persons with Disabilities Department, Govt. of Odisha. https://ssepd.gov.in/

Financial Inclusion of PVTGs

Financial inclusion is a crucial element of social inclusion, particularly useful in fighting poverty and income inequality by opening blocked advancement opportunities for disadvantaged segments of population. Financial inclusion is the process of ensuring access to appropriate financial products and services required by vulnerable groups such as weaker sections and low-income groups at an affordable cost in a fair and transparent method by mainstream institutional players.

Household Savings of Didayi, Kutia Kandha and Juanga

Household savings is usually considered as the most liquid asset. Hence, the study takes cognisance of household savings of PVTG

households which is an essential asset. The saving behaviour of PVTG households as indicated in Table 15 suggests that overall 76.7 per cent of households have undertaken savings; this proportion is 88.7 per cent among the Didayi households, 74 per cent among Juanga households and 67 per cent among Kutia Kandha households. Out of the total households who have undertaken savings, majority (57.7 %) have made their savings in banks followed by SHGs and post offices. Cash saved at home alternatively called cash in hand, is also considered as savings and it is the most important liquid asset. Overall, about 22.6 per cent of the households keep cash in hand which is very much higher among the Kutia Kandha households.

Household Income and Cash flow

The household income and cash flow of the PVTG households mainly take place from spanning an extensive range sources. However, traditionally agriculture, minor forest produces collection and sales, livestock income constitutes to be the major sources of household income among the PVTG households. Apart from these traditional activities, the PVTG households have diversified their livelihood sources to business, wage earning at home place as well as migration, and salary-based income. The average pattern of cash flow in a PVTG household is discussed by examining the economics of each type of livelihood activity being pursued by the PVTG households.

Table 15: PVTGs Household Savings Behaviour

Details of savings	% Of households by PVTG Categories			
	Kutia Kandha	Juanga	Didayi	Total
Percentage households undertake savings	67.0	74.0	88.6	76.7
Place of savings				
Bank	46.3	55.4	67.7	57.7
SHG	14.9	32.4	12.9	19.7
Post office	17.9	16.2	6.5	12.8
Friends/ Relatives	10.4	12.2	7.5	9.8
Cash saved in home	34.3	24.3	12.9	22.6
Total	100	100	100	100
Purpose of Savings				
To meet agricultural costs for the coming season	15	5	39	59
To meet future emergency expenses	16	9	7	32
Education of children	8	19	22	49
House construction	2	0	0	2
To pay off old debt	0	2	1	3

Purchase of livestock	1	0	3	4
To start business in future/ Business Expansion	10	2	0	12
Earning of interest	2	0	8	10
To meet expenses of future social ceremonies	36	49	6	91

Loans and Indebtedness of PVTG Households

Frequently the tribes remain in debt to moneylenders in infinity, and after their death, their indebtedness is handed down to their descendants. Due to indebtedness some tribes lose their lands and fall victims to the practice of debt bondage and land alienation. Indebtedness thus becomes a different form of exploitation of tribes by non-tribes and resulted in deteriorating economic conditions of tribes.

The loan and indebtedness behaviour of the PVTG groups is discussed in Table 16 by considering the elements including extent of household indebtedness, average loan outstanding at the time of survey, source of loans, and purpose of loan. It is found that overall 28.5 per cent of the PVTG households are indebted which is found on the higher side with Juanga relative to Kutia Kandha and Didayi households. About 40.0 per cent of Juanga households, 33.0 per cent of Kutia Kandha households and 13.3 per cent of Didayi households are indebted.

Majority of Kutia Kandha households (94.1 per cent) have loan outstanding amount below Rs. 5000 followed by Juanga households 59.1 per cent and Didayi households 31.3 per cent. However, most of Didayi households have loan outstanding in the range of Rs. 5000 to Rs.10000 (43.8 per cent). Among the Didayi households there were 55.6 per cent reporting their loans from the SHGs followed by Juangas with 44. 6 per cent and Kutia Kondh 36.1 per cent. It is revealed that SHGs have penetrated considerably in these interior regions as most of the PVTG households (43.6 per cent) have availed loans from SHGs. Next to SHGs, friends/relatives are found as major sources of loan among all PVTG categories.

Among the Kutia Kandha and Juanga households 13.9 per cent and 16.1per cent, respectively, are found dependent on moneylenders. Borrowing from moneylender is found as an outdated practice among the Didayi households. With respect to institutional loans, Kutia Kandha households have taken loans from large scale multi-purpose cooperative societies (LAMPs) only. On the other hand, Juanga and Didayi households are more dependent on commercial banks followed by LAMPs.

Table 16: Loan Behaviour of PVTG Households

Details of Indebtedness	PVTG Categories			
	Kutia Kandha	Juanga	Didayi	Total
Percentage of households reporting indebtedness	33.0	40.0	13.3	28.5
Amount of indebtedness (Rs.) (% of households)				
0-5000	94.1	59.1	31.3	67.0
5000-10000	5.9	22.7	43.8	20.2
10000-15000	0.0	11.4	12.5	7.4
>15000	0.0	6.8	12.5	5.3
Total	100	100	100	100
Average amount of indebtedness (Rs.)	2794.1	5795.5	7812.5	5053.2
Source of loans (Percentage of households)				
Banks	0.0	14.3	22.2	10.9
LAMPs	22.2	1.8	11.1	10.0
SHGs	36.1	44.6	55.6	43.6
Friends/ Relatives	27.8	21.4	11.1	21.8
Money Lender	13.9	16.1	0.0	12.7
Rice Mill	0.0	1.8	0.0	0.9
Total	100	100	100	100
Purpose of loan (% of households)				
Agriculture	22.5	11.9	31.3	19.4
Purchase of goat	0.0	7.1	0.0	3.1
Purchase of auto	2.5	2.4	0.0	2.0
Purchase of bullock	0.0	2.4	0.0	1.0
Purchase of poultry	2.5	0.0	0.0	1.0
Business	20.0	33.3	56.3	31.6
Health emergency	27.5	26.2	6.3	23.5
Social and ceremonial expenses	20.0	11.9	0.0	13.3
Education of children	2.5	4.8	6.3	4.1
House Repair	2.5	0.0	0.0	1.0
Total	100	100	100	100

Section 4

Suggestions

1. The women engaged in different SHG based income generating activities should be provided with marketing skills in collaboration with Odisha Livelihood Mission and state-run Mission Shakti programme. The PVTG households are very much specialised in different handicraft activities. These need to

be promoted through proper market linkage by forming Producer Companies. The micro project agencies should ensure proper marketing of the handicraft items produced by the PVTG communities.

2. In the event of health emergency, PVTG people suffer a lot due to inadequate facility of ambulance. There should be more ambulance facility to address their problems.

3. Owing to very small number of days of employment opportunities available in PVTG staying areas, number of days of work per annum per household under MGNREGA based wage employment opportunities should be further increased, which should be at least 180 days per annum. The scope of micro irrigation facilities in the micro project areas should be explored through soil and moisture conservation (SMC) works. This is to note that over time, most of the perennial streams are drying up. Steps should be taken to rejuvenate such streams.

4. All plans for development have greater prospects for success if the applicability of cultural and social factors is integrated into planning process for causing advantages to the tribes. Thus, credit through micro finance (provision of small working capital to self-employed) can benefit them, exclusively their women folk to take up farm allied activities of PVTGs, like processing, packaging, and marketing of turmeric, ginger, pineapple, lemon, orange, and forest-based cottage industries, such as broom making, mat making, leaf cup and plate making, etc.

5. There are provisions for positive discrimination in favour of tribal groups under many anti-poverty and livelihoods programmes. It is important that Didayi, Juanga and Kutia Kondh tribes are identified on objective criteria, especially because of their enormous proneness to malnutrition, hunger, and starvation. Hence, to ensure food security, there is a need to introduce mobile ration shops in all PVTG areas, where ration dealers are unable to establish their shops, and ensure their regular distribution of food grains on fixed days coinciding with the weekly *haat* or tribal market.

6. Cashew plantations in the hill slopes, grafted mango tree plantation, pineapples, banana, lemon, papaya, etc. are essential for horticulture development to generate additional sources of income for the Didayi, Juanga and Kutia Kondh tribes. NABARD should extend its support through its Wadi project for generating employment and income in these PVTG regions.

7. In PVTG areas it is essential to recruit local anganwadi workers and helpers from amongst the local PVTG itself.   All PVTG

households should be given job cards under priority, and two members of the family entitled to get employment under MGNREGA. To prevent further indebtedness, all released bonded workers should also be permitted to draw their full entitlement of grain on credit from PDS shops every month. This should be adjusted against one-third of their daily wages once MGNREGA works are commenced.

8. The Didayi, Juanga and Kutia Kondh youths need to be imparted training for upgradation of techinical competence for their development, improve the quality of human resources essential for effective administration to ensure free from exploitation and finally, enrich the quality of life. The training component should include leadership management, natural environmental protection, maintenance of health and hygine, household management, chid care, etc. for bettering their way of life. Tribes have evolved local specific livelihood strategies based on their indigenous knowledge. Boosting animal husbandry practices in a scientific manner is required as these PVTG tribes possess the indigenous skill in rearing animals.

9. Promotion and strengthening of women SHGs, the provision of pro-poor and vulnerability reduction rural funds, training of CRPs, access to land tenure rights under FRA both for house building and the community, providing smokeless cook-stoves, promoting home based nutrition gardens, improved housing, solar home lighting, etc. are some of the imperative key interventions.

10. Under natural resource management the key interventions comprise of land surveys and issuance of land rights to the PVTGs, construction of irrigation structures like diversion of run off streams, natural resource regeneration to protect water and fuel wood sources, protecting biodiversity, creating access to drinking water, etc.

11. Moreover, building the capacity of the tribal farmers in the sphere of crop development and horticulture, support to horticulture development, cereal food crops including oilseeds, pulses and tubers in all program villages etc. will go a long way in ameliorating the socio-economic conditions of PVTGs.

Concluding Remarks

It has been observed that the benefits of development have not percolated to the PVTGs, rather adversely affected their lifestyle, leading to the violation of human rights, miserable living standard of tribes, restricted community rights over natural resources, and their own forest resources, and finally, culminated in the identity crisis of the

tribes. The indiscriminate exploitation of natural resources by the non-tribes who dominate the government machinery in the tribal area results is not only a threat to tribal survival but is also leading to depletion of resources in tribal regions. Hence, the development schemes and programs must be people centered, eco-friendly, and go hand in hand with their culture, to make a significant dent in the development process of PVTGs.

It has been revealed from the respondent households that negligeable incomes, and limited working of public food, nutrition, and employment programmes, result in income vulnerability, failure to withstand the shocks, like failure of crops, natural calamity, or a health hazard forcing them to seek alternative support, when they need large infusions of cash.

The development paradigm pursued since independence has aggravated the prevailing discontent among marginalized sections of the society. This is because the development paradigm as conceived by the policy makers has always been imposed on these communities, and therefore it has remained insensitive to their needs and concerns, causing irreparable damage to these sections. It is revealed from the respondent households that collection and sale of NTFPs, casual labour and remittances from migrants are their primary sources of income other than agriculture. Animal husbandry constitutes a major source of livelihood as well as a source of dietary protein.

The key factors explaining the highest incidence of poverty in PVTGs regions are: (1) tribes' low bargaining capacity; (2) their low degree of political representation and poor quality of local governance; and (3) constrained access to forest, land, and water. The issue of control, power and access to natural resources is contentious both at economic and political level for tribal groups, apart from deep rooted corruption and massive pilferage of development funds by the government officials (Tripathy, 2014).

Inclusion of the tribal world into the non-tribal domain was predominantly aimed at or focused on economic exploitation of tribal people and their resources. Intentional or not, the tribal people lost their traditional authority over their economic resources - land, forest, and other resources. Several land reform policies, land acquisition act, and even the Forest Rights Act 2006[2] could not ameliorate their socio-economic condition or in supplementing their livelihood.

Notes:

[1]While establishment of these Micro Project Agencies (MPAs), notifications limiting their jurisdiction with names of villages / hamlets were issued by the State Government and, thus, funds and grants-in-aid meant for the development of PVTGs are being utilised for those persons of that community residing within the notified and specified areas only. As a result, the PVTG persons residing in neighbouring and other villages / hamlets but outside the MPA areas are being deprived of the benefits intended for them. To remove such a difficulty encountered by some population of the PVTGs, the Government of Odisha had moved the Government of India in the Ministry of Tribal Affairs (MoTA) for their inclusion under the PVTG development schemes and establishment of few new Micro Project Agencies in the State. Government of India vide their letter F.No.11022/07/2012-NGO(PVTG) Dated:20.04.2017 has clarified that PVTGs are not area specific but are community specific and are entitled to get the benefits meant for PVTGs irrespective of the area where they reside. In the line of clarifications received and suggestive guidelines obtained from MoTA for preparation of Annual Plan for PVTG development, the ST & SC Development Department, Government of Odisha through the SC & ST Research and Training Institute, Bhubaneswar conducted a Baseline Survey during the year 2018-19, which has identified left out population of 13 PVTGs of Odisha in 888 villages/ hamlets located in and around 15 existing Micro Project Agencies of Odisha.

[2]Enactment of Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 which for the first time, recognized the land rights of tribals.

References

Das, C.R. & B. Patra (2021). A study on "The Impact on Deregulation of Kendu Leaf Working in Malkangiri, Nabarangpur & Bhawanipatna (KL) Division, based on Forest Rights Act, 2006", Nabakrushna Choudhury Centre for Development Studies, Bhubaneswar.

Debt and Investment in Odisha, (2018), Based on State Sample report on NSS 70th round, Directorate of Economics and Statistics, Odisha.

Department of Social Security and Empowerment of Persons with Disabilities (SSEPD), Activity Report, 2018-19.

Dhebar, U.N. (1962): Report of the Scheduled Castes and Scheduled Tribes, Commission, Delhi: Government of India Press.

Government of Odisha, 2015, Particularly Vulnerable Tribal Groups (PTGs) of Odisha, Volume I (Ethnography), Scheduled Castes and Scheduled Tribes Research and Training Institute (SCSTRTI), Bhubaneswar.

Government of Odisha, 2018, Base line survey of PVTGs, Scheduled Castes and Scheduled Tribes Research and Training Institute (SCSTRTI), Government of Odisha, Bhubaneswar.

International Institute for Population Sciences (IIPS) and ICF. 2017. National Family Health Survey (NFHS-4), India, 2015-16: Odisha. Mumbai: IIPS.

Ministry of Tribal Affairs, Government of India, Statistical Profile of Scheduled Tribes in India 2013, Statistics Division.

NABARD All India Rural Financial Inclusion Survey 2016 -2017, National Bank for Agriculture and Rural Development Department of Economic Analysis & Research, Bandra-Kurla Complex, Bandra (E), Mumbai.

Olabode, Dada Samuel. (2013), "Utilization of Community Resources for Effective Sustainability of Social Studies Education", International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064, Volume 2 Issue 6, June 2013, https://www.ijsr.net/archive/v2i6/IJSROFF2013302.pdf.

Plan Odisha (2018): Newsletter, Poverty and Human Development Monitoring Agency (PHDMA), Planning & Convergence Department, Government of Odisha, vol. iii, Issue-I.

Tripathy, S.N (2014): 'Naxalism and the Development of Tribal Youths', in 'Tribal Studies: A Journal of COATS', Koraput, Orissa, vol.2, Issue-2, December

Annexure 1

Sample villages Covered in the Study

Sl.	PVTG Category	District and Blocks	Villages	No. of Households covered	Distance from Block HQ (kms)
1	Kutia Kandha	Tumudibandha Kandhamal	Gunuspa	17	38
2			Germeli	17	35
3			Burlubaru	17	31
4			Deogada	17	23
5			Tidipadar	16	20
6			Guchuka	16	18
7	Juanga	Banspal, Keonjhar	Ghungi	17	52
8			Kundhei	17	48
9			Toranipani	16	48
10			Tangarpada	17	43
11			Talapada	17	35
12			Gonasika	16	32
13	Didayi	Malkangiri, Karkonda	Suripada	11	58
14		Khairaput	Bayapada	18	42
15			Tumapadar	18	25
16			Suripadar	6	20
17			Chillipadar	17	17
18			Muduliguda	17	14
19			Puruna Gumma	18	13
	Total Three PVTGs	Total three districts covering four blocks	Total 19 villages	305 Households	Average distance 31

Climate Change and Indirect Vulnerability of Human Health in Odisha: An Application of Disability-Adjusted Life Years

Jyoti Rekha Purohit
Himanshu Sekhar Rout

Abstract

The climatic extremes affect the health status indirectly through influences on the vectors and pathogens that cause infectious diseases like malaria, dengue and diarrhea. Rising temperature and erratic precipitation pattern enhances the vector borne diseases like malaria and dengue as the internal temperature of the vectors are greatly affected by the temperature and humidity of the environment. The erratic precipitation pattern influences diarrheal diseases among children and indirect health burden by cardio vascular diseases is attributed to rising temperature. The analysis of the indirect vulnerability of human health in Odisha to the impacts of climate change was done by using DALY method for the diseases like malaria, diarrhea and stroke for the period from 2000 to 2020. The potential disease burden induced by climate change in Odisha over the period of 20 years was found to be more from stroke on the age group of 40-45 with high DALY value followed by Malaria on the age group of 10-15 children and childhood diarrhea for the age group 0-5 while the elders are more vulnerable groups in terms of mortality from stroke signifying the drastic indirect health impact of climate change. The cost-effectiveness analysis in DALY calculation was done to analyze the number of DALY that can be averted through appropriate health policy implications.

Jyoti Rekha Purohit, Doctoral Scholar, Department of Analytical and Applied Economics, Utkal University, Bhubaneswar.
Email: jyotirekha12@gmail.com

Himanshu Sekhar Rout, Head of the Department of Analytical and Applied Economics, Utkal University, Bhubaneswar.
Email: hsrout@utkaluniversity.ac.in

1. Introduction

The indirect vulnerability of human health due to climate change is observed in terms of disease burden. Climate change is leading to expansion of vector borne diseases (VBDs) like malaria, dengue and diarrhea with changing temperature and precipitation pattern (Rocklov & Dubrow, 2020). India is endemic to both malaria and dengue. Climate change is expanding the geographical distribution of these VBDs (Dhiman et al., 2010). The climatic extremes affect health status indirectly through influences on the vectors and pathogens that cause infectious diseases like malaria, dengue and diarrhea. The most important indirect impact of climate change includes increased vector, water-borne diseases caused by extreme hydro-geological events and heat-related diseases (Markendaya & Chiabi, 2009). Anthropogenic climate change due to heavy carbon dioxide (CO_2) emission directly affects the behavior and geographical distribution of vectors through rising temperature that indirectly affect human health. The biological activity, geographical distribution and seasonal incidence of malaria parasite and dengue vectors are very much sensitive to the climatic influences like temperature, precipitation and humidity and puts human health at high risk due to the conducive environment of its expansion and transmission as a result of climate change (Bentham, 1992; Martens et al., 1995; Mc Michael & Haines, 1997; Haines et al., 2000; NATCOM, 2004; NATCOM, 2012; Tsai & Liu, 2005; Khasnis & Nettleman, 2005; Moreno, 2006; Majra & Gur, 2009; Lancet Report, 2015).

The altered rainfall directly affects humidity that significantly increases mosquito survival whereas drying up rivers and ultimately formation of pool in river beds in wet tropical regions due to scanty rainfall also increases malaria transmission (Singh & Purohit, 2014). The fastest spreading a VBD like dengue is the major impact of climate change on health through climate-induced ecosystem change by rising temperature and changing pattern of rainfall with doubling its number of cases worldwide between 1990 and 2013 (Woodward, 2019). Studies by Garg et al. (2009) observed a two-week time lag between rainfall and the vector abundance in the forest-fringed villages of Assam and Vanderwal and Paulton (2013) found 9-to-11-week time lag between malaria incidence and rainfall in Mahabubnagar district of Andhra Pradesh. Similarly, almost every developing country faces a diarrhea outbreak or threat of an epidemic after the advent of flood (NATCOM, 2004; NATCOM, 2012; Vanderwal & Paulton, 2013). Continuing as the major child killer, diarrhea caused over 200,000 deaths in India during 2010 (Liu et al., 2018)

As per NATCOM (2004), Odisha, Madhya Pradesh, Chhattisgarh and the north-eastern states are the most vulnerable states for malaria; among which Odisha has the highest Annual Parasite Index (API) followed by Madhya Pradesh and Chhattisgarh. The malaria risk is

expected to increase in coming years with the slow onset of climate change with a tendency of malaria incidences below or above normal after an extreme event like drought, flood or heavy rainfall.

Similarly, NATCOM (2014) states that 1-3 months transmission windows (TWs) are projected to open for malaria transmission in Uttarakhand, Himachal Pradesh, parts of Jammu & Kashmir, Sikkim and Arunachal Pradesh by 2030 drawing upon the baseline temperature of 1961-1990, while there will be an increase in the TWs in the southern states of 10-12 months. Rajasthan, central India, Jharkhand, Chhattisgarh, Odisha, West Bengal and north-eastern states will experience 7-9 months of TWs. Based on temperature and relative humidity, northern parts of India will experience 1-3 and 7-9 months of TWs. States like Rajasthan, Jharkhand, Chhattisgarh and parts of Gujarat and Karnataka are expected to experience the malaria transmission open for 1-3 or 4-6 months. Dengue transmission will not be that much conducive with slight opening of TWs of 1-3, 4-6 and 7-9 months. Based on temperature and relative humidity of baseline period, the TWs of 7-9 months and 10-12 months are expected to decrease while there will be an increase in the TWs of 1-3 months and 4-6 months.

Besides VBDs, increased temperature results in a high risk of heart diseases (McMichael & Githeko, 2001; Singh & Purohit, 2014; Kovats & Haines, 2005; Singh & Dhiman, 2012; NATCOM, 2004; NATCOM, 2012). Heat exposure raises potential health threat from cardiovascular mortality (Moghadamnia et al., 2017). Lin et al. (2013) have explained about the association between rising temperature and cardiovascular risk as 1 per cent increase in temperature results in 2-5 per cent increase in the mortality rate.

Hence, the phenomenon of climate change has been greatly influencing the transmission of diseases, like malaria, dengue, diarrhea and also aggravating the CVD conditions like stroke. Odisha, the eastern Indian state is also no exception of it. Due to its geographical location at the coast of Bay of Bengal, it is highly vulnerable to the impact of climate change directly in terms of periodic occurrence of natural disasters as well as indirectly through the transmission of diseases along with the widening of the geographical spread of it within the state mediated by variation in temperature and erratic pattern of rainfall. The state has experienced emergence and re-emergence of many infectious diseases including climate sensitive VBDs in recent years. Many districts in the state have experienced marked increase in VBDs like malaria, dengue, Japanese encephalitis, chikungunya, scrub typhus along with water borne diarrheal diseases (SAPCCHH, 2022-27).

Human health in Odisha is quite sensitive to changing climate and weather pattern due to its geographical position, resource constraints,

heavy dependence of population on climate sensitive sectors, depletion of forest cover, urbanization and changing pattern of climate sensitive infectious diseases. Any further increase in climate related health effects may cripple the already limited resources of the state. The issues of health risks induced by climate change were discussed but scant and particularly, for Odisha case, climate change and health research is yet to take off. Hence, there is a need to identify the indirect vulnerability of human health in the state to protect the human health from the detrimental impact of climate change. The response option to protect the indirect health effects of climate change includes quantifying the diseases burden induced by climate factors. In this context, this paper has tried to study the climate induced disease burden by using the technique of Disability Adjusted Life Years (DALY).

The objectives of the study are (i) to analyze the human health vulnerability to climate change in Odisha by using DALY; and (ii) to understand the use of DALY in cost effectiveness analysis (CEA) for reducing the indirect human health vulnerability of climate change.
The paper is structured as follows. In Section 2 a conceptual review of indirect vulnerability of human health is put forward that explains how the changing climate enhances the burden of diseases like malaria, dengue, diarrhea and stroke. Section 3 discusses the data and methodology used in the study. Section 4 presents the disease burden of the state due to the incidence of malaria, dengue, diarrhea and stroke over the study period 2000-20. This shows the indirect vulnerability of the human heath due to changing climate with the DALY analysis. The discussion includes the CEA mechanism that can be applied as adaptive options to reduce the indirect vulnerability of human health due to climate change. Conclusions are drawn in Section 5.

2. Review of Literature

Climate change contributes to the alterations of climatic variables, like temperature and precipitation pattern which provide conducive environment for the distribution and transmission of pathogens leading to the outbreak of infectious diseases with more frequency and severity. The human health is, thus, subjected to more exposure to these infectious diseases being influenced by the shift in the geographical and seasonal pattern of the pathogen. Climate change thus contributes to the indirect health threat by the infectious diseases directly through influencing the survival and reproduction of pathogen and indirectly through by affecting their habitat and ecology. This section of the paper provides the literature survey on how the climate change influences the occurrence of VBDs (Malaria and Dengue), infectious diseases (Diarrhea) and Stroke (CVD) and makes the human health vulnerable indirectly.

2.1 Malaria

Among VBDs, malaria is considered to be highly influenced by the spatial and temporal changes in the environment being conducive to the breeding activity driven by the climatic variability, with temperature, rainfall and humidity being the major influencing climatic factor that shorten the incubation periods of the parasite and make the transmission period longer (Martens et al., 1995; McMichel, 2003; Bhattacharya et al., 2006, Devi & Jauhari, 2006; Dhara, Schramm and Luber, 2013; Rocklov & Dubrow, 2020). Rainfall pattern plays a significant role by influencing the reproductive cycle of the vector. Thus, it provides the suitable breeding sites (Mall et al., 2017). The two transmission windows TW1 (Tmax ≤35 °C; Tmin ≥ 20 °C; RH ≥ 55%) and TW2 (25 °C ≤ T ≤ 30 °C; 60% ≤ RH ≤ 80%) favorable for transmission of VBDs, are found to be satisfied for many days during the south-west monsoon (June-Sept.) and the post-monsoon season (Oct-Dec) over different parts of India (Dogra & Srivastava, 2012).

The early warning system for malaria in India that provides information for the disease risk working combined with human and meteorological factors have projected the shift of malaria geographical range from central regions towards South-Western and Northern states with rainfall alone accounted for 45% of variation in malaria transmission. The Northern and Western states are expected to experience the widening duration of transmission window whereas the Southern states are expected to experience the shortened duration with likely persistence in Odisha, West Bengal and Northern parts of Assam (Dhara, Schramm & Luber, 2013).

2.2 Dengue

Like Malaria, Dengue is also a prominent disease that has become a serious challenge to public health globally. According to WHO report (2017), the estimated annual global dengue disease burden from 120 countries is 390 million cases. It is an underestimated number because; many cases are unreported and asymptomatic. The disease burden is more concentrated in the South East Asian countries like Thailand, India and Indonesia with more rapid and frequent incidence since the mid-90s in India. At the initial stage in India, the potential health threat from dengue was confined to some of the states only; but later, it expanded to all most every state of the country. Odisha, the eastern state of India, started to bear the disease burden since 2010 in all most every district. The surveillance data states the state's contribution to total dengue cases in the country as 10-15% (Swain et al., 2020). Like malaria, the survival of dengue viruses in Aedes mosquitoes is also greatly influenced by climatic conditions like temperature, rainfall and relative humidity (Martens et al. 1995, Ansari & Razdan, 1998; Sharma et al., 2005; Tsai & Liu, 2005; Backer, 2008; Dhiman et al., 2010 and Paz,

2020). The suitable temperature range for the survival of virus is 18^0C to 42^0C (Reuda et al., 1990).

Under the scenario of 4^0C rise in temperature, the dengue transmission is expected to rise 2 to 5 times with the northern sub-Himalayan region and the Southern most parts of India being emerged as the new transmission areas. Increase in one week transmission period in New Delhi is expected followed by 2^0C rise in temperature; whereas, 4^0C rise will reduce the transmission period to 34 weeks. In Kolkata, the transmission period of Dengue is 44 weeks. With 2^0C and 4^0C rise in temperature will lead to continuance of transmission period for 53 weeks (Jetten & Focks, 1997). Hales et al. (2002) study projects global dengue risk of 3.5 billion people being exposed to the disease.

2.3 Diarrhea

Diarrhea is mainly water borne disease. The diarrhea condition puts health burden on human population after climate events like heavy precipitation, flood resulting in contamination of ground and surface water (Biswas et al., 1999; Rose et al., 2001; Mondal et al., 2001; Chou et al., 2010; El-Fadel, 2012; Kazma et al., 2012; Dhara et al., 2013; Carlton et al., 2013). Any ecological disturbances followed by climatic events shift the hosts' vectors or change the habitat resulting in more likelihood of transmission and infection (Lip, Hauq & Colwell, 2002). The reproduction, persistence and survival of pathogens causing diarrhea is manipulated by the meteorological conditions that act as the environmental reservoirs of pathogen and govern the timing and intensity of seasonal outbreaks (Moors et al. 2013). Zaidi, Awasthi and deSilva (2004) have explained that, infectious disease is the major cause of death in South East Asia with diarrhea as the major child killer. The influencing climatic factors responsible for the intensity of transmission of diarrheal pathogens are temperature, humidity and rainfall. As higher temperature increases the replication and survival rates of pathogens while erratic rainfall contributes the most to the contamination of the water bodies by flushing fecal materials into it (Dhara, Schramm & Luber, 2013; Carlton et al., 2013).

2.4 Cardio Vascular Disease

When Cardio Vascular Disease (CVD) is explained being influenced by any climatic variability, it is best referred as temperature-mortality relationship, a consequence of heart alignment. There is strong relationship between ambient high and low temperature and heart diseases (Giang et al., 2014; Moghadmnia et al., 2017; Mall et al., 2017). A significant association between extreme temperature and cardiovascular mortality has been observed by Basu and Samet (2002), and Majra and Gur (2009). At rising temperature beyond the threshold level, blood flow from the vital organs to the skin takes place to provide a cooling effect. This mechanism interferes with the body

temperature for thermoregulation along with increased viscosity of blood and cholesterol level and excessive sweating imparts pressure on heart and lungs (Smoyer et al., 2000; Lin et al., 2013). The ability to regulate body temperature and elevated sweating decreases with age making the older more vulnerable to the CVD. The elderly people loose body fluid and become dehydrated when exposed to hot temperature. Thus, eventually, they experience the cardiovascular complications. A study by Bull and Morton (1975) showed that temperature before 1 to 2 days of death is most significant in the case of myocardial infarction, and before 3 to 4 days of death in case of heart strokes.

Therefore, the climatic parameters, like variation in temperature and rainfall pattern act as the most influencing factors. This potential health threat as a consequence of climate variability is viewed as indirect vulnerability of human health to the climate change.

3. Data and Methods

The study used the secondary data collected from Directorate of Public Health (DPH), Government of Odisha for the diseases, malaria, dengue, childhood diarrhea and stroke. The study period is 20 years from 2000 to 2020. The study has used two methods, (i) DALY to show the vulnerability status of human health in the state over the 20 years due to the burden of diseases of malaria, dengue, diarrhea and stroke; (ii) Cost-Effectiveness Analysis (CEA) to show how much disease burden (DALY) could be averted during the study period of 20 years in the state that would reduce the human health vulnerability. CEA gives the idea to reduce this much of disease burden which type of policy intervention is needed that will be cost-effective.

3.1 Methods for DALY

To show how much the human health in Odisha is indirectly vulnerable to the impact of climate change, first DALY methods is used. For the calculation of DALY, data of number of cases and number of deaths for the diseases of malaria, dengue, diarrhea and severe stroke in the state Odisha is used. The Malaria data for the number of cases and number of deaths is separately available for the age groups of 0-5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70 and 70-75 years which is used in the calculation of DALY. However, data for Dengue was not available in age-specific manner. Again, the data was not available for the period of 2000 to 2009. Data could be accessed for the period from 2010 to 2020 including the age groups from 10 to 75 years. The analysis for diarrhea is done as childhood diarrhea case and number of deaths from diarrhea in the state of 0-5 age group of children. For stroke, the data of number of cases and number of deaths is used for the age

group of 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70 and 70-75 years.

The data has been collected from different sections coming under Directorate of Public Health, Odisha. Malaria and dengue data were collected from National Vector Borne Disease Control Program (NVBDCP) office, whereas diarrhea data were collected from Integrated Disease Surveillance Program (IDSP) section and stroke data is collected from National Program for control of Diabetes, Cancer and Stroke (NPCDCS) office. Expert opinion (Mr. Srikant Kanoongo, scientist, RMRC) is taken for the information regarding the average duration of each disease to use in the study for the DALY analysis. Also, inference is drawn in the study from the discussion with the expert to address the issues of disease burden in the state and policy implication.

DALY is increasingly used in recent years to quantify the disease burden on human population. Every person is borne with a certain numbers of life years living in an optimal health condition. They may lose some healthy life years due to illness or may die before a reference life expectancy. DALY measures these lost healthy life years of a person. The disease burden is reflected as the number of premature death and morbidity (WHO).

DALY is calculated by adding the adjusted number of years lived with disability (YLD) and the number of years lost (YLL) due to disease.

$$DALY = YLL + YLD;$$

Where YLL is the years of life lost and
        YLD is the years lived with disability
$YLL = N \times L;$
Where, N= Number of deaths due to disease condition
        L= Standard life expectancy at the age of death in Years.
$$YLD = P \times DW;$$
Where, P= Number of Prevalent Cases
        DW= Disability weight of a specific condition Reflects the severity of a disease on a scale from 0 (perfect health) to 1(dead).

Disability weight is given as per the disease condition that how much the disease condition affects a person which is derived from WHO report on Global Disease Burden, 1990 as follows (Table 1).

The study has taken 3 per cent health discounting rate for the calculation of YLL and YLD which defines the loss of healthy life of a person due to disease conditions as every individual suffers from some sort of illness throughout his/her total life span. It discounts the individual's healthy and productive life-years. The value of a year-life

is generally decreased annually by a fixed percentage (3%) as recommended by the World Bank Disease Control Study and GBD project (Murray & Acharya, 1997; Larson, 2013; Mohanty et al., 2020)

Table 1: Disability Weight and Average Duration of Disease

Disease	Disability Weight (Range of 0-1)	Average Duration
Malaria	0.191	14 days
Dengue	0.254	6 days
Childhood Diarrhea	0.105	5days
Stroke (severe condition)	0.92	1 year

Source: Global Burden of Disease Report (GBD) by WHO, 1990 (disease weight) and expert opinion (average duration of disease)

YLL is estimated as;   YLL$= \frac{N}{r} (1-e^{-rl})$

Where, N= No. of Death;

$\qquad$ l= Life Expectancy at the age of death;

$\qquad$ r= Discount Rate of 3%

YLD$= \frac{I \times DW \times L \times (1-e^{-rl})}{r}$

L= Duration of Disability;

I= Incidence

The number of YLL takes into account the age at death compared to maximum life expectancy while YLD takes into account disease burden. Disability weight describes the severity of disease (Table 2).

The life expectancy for each specific age group used in the DALY analysis is derived from the Standard Abridged Life Table of the state Odisha, 2013-17. As the data for dengue was not available in the age specific manner, the average life expectancy from 0 to 75 ages was used in the study.

3.2 Methods for CEA

For CEA, the total discounted life years from each disease in each specific age group in each year of the study period (2000-2020) is calculated to show how much DALY of that age group could have been averted in the state over the period of 20 years with health policy interventions. CEA takes into account the YLL (3, 0) for persons who die on a particular age with age-specific life expectancy and annual discounting factor as e^{-rt} (Bruce-A Larson Methods, Larson Cost Effectiveness and Resource Allocation, 2013). For the analysis, first the discounted life Years of one individual is calculated by multiplying the discounting factor with the particular diseases weight in the surviving years; and 1, in case of death in the five years interval of the specific age group and then the total number is added. The discounting factor is e^{-rt}; where r is discounting rate 3% and t is the particular year of the

time interval of 5years age specific group, before 1st year, 1st year, 2nd year, 3rd year, 4th year or 5th year. After that, the total discounted life years for each disease taken in the study is calculated by multiplying the number of persons died due to the above diseases each year taken in the study with the calculated discounted life year's value of one individual at each time interval of 5-years-age specific group. However, for dengue cases, it is not possible to calculate as the data for it is not available in age-specific manner.

Table 2: Variables used in the Study and Data Source

Disease	Variables Used	Age Groups	Data Source	Time Period
Malaria	Number of cases and number of deaths	0-5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75	National Vector Borne Disease Control Program office, DPH, Government of Odisha	2000-2020
Dengue	Number of cases and number of deaths	Not available in an age specific manner like malaria. No. of cases and no. of death included in age group 0-75	National Vector Borne Disease Control Program office, DPH, Government of Odisha	2010-2020, data was not available for the period 2000-2009
Childhood Diarrhea	Number of cases and number of deaths	0-5	Integrated Disease Surveillance Program section DPH, Government of Odisha	2000-2020
Stroke	Number of cases and number of deaths	30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75	National Program for control of Diabetes, Cancer and Stroke, DPH, Government of Odisha	2000-2020

Source: Authors' Compilation

Discounted life year of one individual of age specific group 0-5 from malaria is in the year 2000 is-

$e^{0.03×0}$ (discounting factor) ×1(in case of death before reaching the 1st year)

Or, $e^{0.03×0}$(discounting factor) × 0.191 (disease weight if the person has survived till the completion of one year);

0.03 is the discount rate of 3% and 0 represents the time period, i.e., before reaching the 1st year of the 5years age interval of 0-5 age group.

The discounted life year of one individual who survived before reaching the 1st year and died in the 1st year of 0-5 specific group will be-

$e^{0.03*0} ×0.191+e^{0.03*1}×1+ e^{0.03*2}×1+ e^{0.03*3}×1+ e^{0.03*4}×1+ e^{0.03*5}×1=X_0$

$e^{0.03*0} ×0.191+e^{0.03*1}×0.191+ e^{0.03*2}×1+ e^{0.03*3}×1+ e^{0.03*4}×1+ e^{0.03*5}×1=X_1$ (survived till the 1st year and died in the 2nd year of 5yrs interval of 0-5 age group)

Similarly, if the person has survived the 1st year and second year but died in the 3rd year, then the total discounted life years will be-

$e^{0.03*0} ×0.191+e^{0.03*1}× 0.191+ e^{0.03*2}× 0.191+ e^{0.03*3}×1+ e^{0.03*4}×1+ e^{0.03*5}×1=X_2$

$e^{0.03*0} ×0.191+e^{0.03*1}× 0.191+ e^{0.03*2}× 0.191+ e^{0.03*3}×0.191+ e^{0.03*4}×1+ e^{0.03*5}×1=X_3$

$e^{0.03*0}×0.191+ e^{0.03*1}×0.191+e^{0.03*2}×0.191+ e^{0.03*3}×0.191+e^{0.03*4}×0.191+ e^{0.03*5}×1=X_4$

$e^{0.03*0}×0.191+e^{0.03*1}×0.191+e^{0.03*2}×0.191+e^{0.03*3}×0.191+e^{0.03*4}×0.191+e^{0.03*5}×0.191=X_5$

The total discounted life years of an individual before reaching 1st year are X_0. X_1, X_2, X_3, $X4$ and X_5 represent discounted life years of one individual in the 1st year, 2nd year, 3rd year, 4th year and 5th year of the 5years interval of age specific group.

After deriving the total discounted life years of one individual in the age group of 0-5 from malaria, the total number of discounted life years of 'N' individual in the year 2000 in the specific age group from malaria is calculated by

$N_0×X_0+N_1×X_1+ N_2×X_2+N_3×X_3+N_4×X_4+N_5×X_5;$

Where, N_0, N_1, N_2, N_3, N_4, N_5 are the number of persons died before 1st year, in the 1st year, in the 2nd year, in the 3rd year, in 4th year and in 5th year of the age specific group of 0-5 respectively.

In this way the total discounted life years of 'N' individual is calculated for each disease for each age specific group for each year of the study period from 2000-2020. This represents the total number of disease burden that could be averted with policy intervention. For CEA analysis, the variables used is the number of persons died in each year of the age specific group of 5 years age interval and the data source are same as the sources previously explained for malaria, diarrhea and stroke. However, CEA of dengue was not possible due to the unavailability of data. The CEA in the study followed the

methodology used in Larson Cost Effectiveness and Resource Allocation, 2013.

4. Result Analysis

At the first place, the disease burden from malaria, dengue, childhood diarrhea and stroke are quantified on different age groups in each year for the period 2000-20 using DALY method. After that, CEA explores the possibility of averting the diseases burden as CEA helps the planner, health policy makers and decision makers to have an idea about the types of health policy intervention that can be implemented to reduce the quantified disease burden.

4.1. Disability Adjusted Life Years (DALY)

DALY is used to analyze the health burden in the state from the disease, malaria, dengue, diarrhea and severe stroke per 1000 population each year over the periods of 20 years from 2000-2020. For malaria, it is calculated as DALY/ 1000 population for the age group of 0-5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75. For dengue, as the required data was not available in an age specific manner, with very few cases being reported even no available data for 2000-09, DALY is calculated by taking average life expectancy from age group 0-5 to 70-75 as the number of dengue cases and number of deaths from dengue included 4years as lowest age individual and 72 as highest individual. DALY/1000 children are calculated to quantify diarrhea burden among the children 0-5. The DALY for severe stroke per 1000 population is calculated for the age group 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70 and 70-75. Before 30-35 age groups, the data for severe stroke case as well as stroke death is not available. For malaria and severe stroke DALY is calculated separately for every age group and then all the DALY values of different age groups are added to quantify the aggregate disease burden in the state for every year and ultimately the aggregate disease burden in the state over the 20 years.

Table 3 reveals that the indirect health vulnerability of climate change in Odisha is more from stroke every year of the study period followed by malaria and childhood diarrhea. The dengue burden has been shown to be much less. This is partly because though the threat from dengue grew rapidly after 2009 for the following decade there were no systematic age-specific data available on its spread.

Table 4 shows that the disease burden in the 20 years of study is the maximum from stroke followed by malaria, childhood diarrhea and dengue. While comparing across age groups, from 30-35 to 70-75 it is stroke with the health burden higher for the age group 40-45 (3624.968 DALY). The age group of 10-15 is more vulnerable to malaria (269.176 DALY) amongst the group from 0-1 to 70-75. DALY for childhood

diarrhea is calculated for 0-5 age group of children which also possesses potential threat with 514.061 DALY during the period of 2000 to 2020.

Tables 3 and 4 represent the vulnerability of human health in Odisha to the impact of climate change over the 20 years, from 2000-20. Though the DALY values have been fluctuating over the years it points to the fact that health is indirectly vulnerable to the impact of climate change. The DALY value of malaria has remained high till 2017 and has fallen considerably in the following years; this can be attributed to the 'Anti-malaria Program' initiated by the Government of Odisha.

Table 3: Total DALY/1000 population of different diseases in Odisha for the period 2000 -2020

Year	Malaria	Dengue	Diarrhoea	Stroke
2000	92.105	0	25.575	1147.583
2001	87.418	0	15.171	1143.516
2002	94.622	0	22.268	1185.963
2003	83.955	0	19.773	1341.722
2004	82.858	0	13.975	992.2966
2005	79.327	0	4.301	816.3233
2006	76.902	0	14.0804	832.4204
2007	73.914	0	18.197	795.8926
2008	74.138	0	20.272	872.0168
2009	74.756	0	14.763	931.9354
2010	80.523	0.121	14.302	1062.609
2011	61.029	0.965	29.356	1416.952
2012	52.156	0.359	36.459	1425.28
2013	45.720	0.833	36.385	1632.525
2014	75.194	0.837	36.106	1634.288
2015	82.893	0.284	29.878	2151.338
2016	84.696	1.073	32.616	2507.093
2017	66.347	0.545	33.873	1928.08
2018	14.918	0.622	26.102	2062.196
2019	10.476	0.459	34.731	2216.582
2020	10.812	0.048	35.8702	2410.8

Source: Authors' Calculation

Notes:

Malaria: the DALY values of 0-5, 5-10, 10-15, 15-20, 20-25, 25-40, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75 is added

Dengue: For dengue, as the required data was not available in an age specific manner, with very low cases being reported even no available data from 2000-2009, DALY is calculated by taking average life expectancy from age group 0-

5 to 70-75 as the number of dengue cases and number of death from dengue included 4years as lowest age individual and 72 as highest individual
Stroke: the DALY values of 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75 is added

Childhood Diarrhea: DALY values of the single age group 0-5 is presented

Table 4: The Overall Disease Burden in Odisha, 2000-20

DALY/1000 Value	Malaria	Dengue	Childhood Diarrhea	Stroke
Total	1404.77	6.152	514.061	30507.413
Average	66.89	0.29	24.48	1452.73
Maximum	94.62 (2002)	1.07 (2016)	36.46 (2012)	2507.09 (2016)
Minimum	10.48 (2019)	0.00 (2000 to 2009)	4.30 (2004)	795.89 (2007)

Source: Authors' Calculation

The DALY values of stroke have been rising since 2010 with younger population being more vulnerable to rising temperature. Besides, changing life styles, too much stress, nutrition pattern and lack of awareness contribute to it. Childhood diarrhea has also put potential disease burden in the state. However, the DALY values of diarrhea have not been fluctuating much. It has not declined despite much efforts through the state vaccination program. Accessibility and utilization of healthcare also varies substantially across urban and rural areas.

4.2. Cost-Effectiveness Analysis

The CEA of the disease burden has important implications for health policy implication. In the health sector, DALY has become widely used as an effectiveness indicator. Thus, the CEA explains the number of DALY per disease that can be averted by the health policy intervention which can help the government for the planning and preparation of optimum financial resource allocation to reduce the disease burden posed by climate change. The total discounted life years from Malaria with age specific cases from 0-5 up to 70-75, childhood diarrhea of age group 0-5 and stroke for the age groups from 30-35 to 70-75 is calculated to know the number of DALY that could be averted from each disease.

As shown in Table 5, after deriving the discounted life years for one individual of each time interval of 5-year age specific group, the total discounted life years from malaria, diarrhea and stroke for each age group taken in the study is calculated by multiplying the individual's discounted life years of each age interval with the number of persons died in each time interval, i.e., the number of death before 1st year, the number of death in the 2nd year, the number of death in the 3rd year, the number of death in the 4th year and the number of death in the 5th

year in the specific age group. For malaria, it calculated for the age specific group from 0-5 to 70-75 separately, whereas, for childhood diarrhea, the total discounted life years is calculated for the age group 0-5 and for severe stroke, it is calculated for the age specific group from 30-35 to 70-75. To show the aggregate DALY that could be averted from malaria and stroke, all the discounted life years' values of different age groups, from 0-5 to 70-75 for malaria and 30-35 to 70-75 for stroke have been summed up. However, the discounted life years from dengue could not be calculated as the number of dengue cases and number of death data for the disease were not available.

Table 5: Discounted Life Years of One Individual for Diseases and Discount Factor for Diseases in Each Year of 5 Years Age Interval

Diseases	before 1st year	1st year	2nd year	3rd year	4th year	5th year
Malaria	5.146	5.143	3.536	2.734	1.934	1.137
Diarrhoea	5.060	4.168	3.278	2.391	1.507	0.625
Stroke	5.875	5.795	5.716	5.637	5.558	5.479
Discounting Factor (e^{rt})	1.000	0.997	0.994	0.991	0.988	0.985

Source: Authors' Calculation

Table 6: Total Discounted Life Years of Different Diseases in Odisha, 2000-2020

Year	Malaria	Childhood Diarrhoea	Stroke
2000	1892.066	2792.925	1986.492
2001	1392.432	1685.973	1407.404
2002	2108.991	1805.183	1145.327
2003	1611.514	1737.063	1182.085
2004	1492.256	1431.575	1944.412
2005	1638.48	216.6112	1949.73
2006	1704.211	664.1713	1582.703
2007	1439.365	1089.922	1809.563
2008	1328.674	1175.072	2188.063
2009	1133.044	1179.547	2383.611
2010	1571.95	1136.519	4079.678
2011	1075.17	2435.295	5776.304
2012	918.558	4002.058	6372.12
2013	902.418	3512.988	5091.804
2014	883.907	3235.706	2776.533
2015	878.406	1345.373	2751.29
2016	829.846	2848.273	4105.721
2017	744.657	2967.19	5034.69
2018	664.93	1277.252	5348.923
2019	668.31	5914.392	5600.672
2020	688.336	6122.91	5732.856

Source: Authors' Calculation

Notes:

Malaria: the discounted life years values of 'N' individuals of the age groups of 0-5, 5-10, 10-15, 15-20, 20-25, 25-40, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75 is added to get the total number of DALYs that could have been averted.

Stroke: the discounted life years values of 'N' individuals of age groups of 30-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-70, 70-75 is added to show the how much disease burden could have been averted

Childhood Diarrhea: the discounted life years values of 'N' children in the age group 0-5 are presented that could have been averted with pro-active health interventions.

Table 6 shows the DALY that averted by health policy intervention which provides a picture of required resource allocation and expected expenditure for the implication of health policy to reduce the indirect health vulnerability posed by climate change. Observing the current scenario of disease burden and the DALY values that can be averted, the health planners and policy makers can choose policy options that would be feasible with optimum resource allocation for a poor state like Odisha.

5. Conclusion and Policy Implication

Climate change influences the transmission of diseases directly through the survival of the pathogens and the vectors, and indirectly by changing their habitat. Odisha is no exception due to its geographical location and poor resources with higher impact magnitude of the changing climate aggravating its indirect health vulnerability. The study reveals that the indirect health vulnerability of the state is higher in terms of stroke, where the stress factor is rising temperature, followed by malaria and childhood diarrhea, with the rainfall and climate events being the stress factor. The study has found that the older people succumb to stroke while the young ones aged 40-45 years bear the more stroke burden in the state, as both mortality (YLL) and morbidity (YLD) remain high signifying the high DALY value for this age group. The CEA also reveals the highest discounted life years from stroke which signify the need for proactive health approach as an inclusive door-to-door awareness generation program to reduce the potential health threat posed by stroke. Dengue has emerged as a health threat in Odisha since 2010 with cases being reported from all most all districts. But dengue cases data are not properly maintained which needs the enhancement and improvement of disease surveillance system in the state. As the dengue incidence case is not maintained in an age segregated manner, the average disease burden is calculated which does not provide a clear picture of the disease burden on different age groups.

Hence, disease monitoring and surveillance system needs to be strengthened to ensure CEA of diseases and better resource use towards improved health infrastructure. Epidemiological surveillance is a necessity which enables the early detection of diseases incidence, mortality and the transmission range of VBDs associated with climate change. However, this requires regular reporting of specific health outcomes and statistical analysis of data. Local and national organizations must participate for the strengthening the VBD control program. Besides, there is an urgent need to reduce the indirect vulnerability of climate change induced human health by addressing the dysfunctionality of the parallel working of the meteorological, environmental and health departments. This would reduce uncertainty in tracking, monitoring and evaluating the disease burden with early warning system for disease transmission. Climate change remains the biggest stress factor and to address its indirect vulnerability on human health, specific projections of health implications of infectious diseases induced by changing climate is necessary with proper disease surveillance system at the regional level.

References

Ansari, M. A., & Razdan, R. K. (1998) *Seasonal Prevalence of Aedes aegypti in Five Localities of Delhi*. WHO Regional Office for South East Asia. Retrieved from https://apps.who.int/iris/handle/10665/148643 (Accessed on 17 May, 2016)

Bull, G. M., & Morton, J. (1975). Relationship of Temperature with Death Rates from all Causes and from certain respiratory and Arteriosclerotic Diseases in Different Age Groups. *Age and Aging, 4*(4), 232-246.

Bentham, G. (1992). Global Climate Change and Human Health, *Geo Journal, 26*(1), 7-12.

Biswas, R., Pal, D., & Mukhopadhyay, S. P. (1999). A community-based study on health impact of flood in a vulnerable district of West Bengal, *Indian Journal of Public Health*, 43(2): 89-90.

Basu, R., & Samet, M. J. (2002). Relation Between Elevated Temperature and Mortality: A Review of the Epidemiologic Evidence, *Epidemiologic Reviews, 24*(2), 190-202.

Bhattacharya, S., Sharma, C., Dhiman, R. C., & Mitra, A.P. (2006). Climate change and malaria in India, *Current Science, 90*(3), 369-375.

Beckar, N. (2008). Influence of climate change on mosquito development and mosquito-borne diseases in Europe, *Parasitology Research, 103*(1), 19-28.

Chou, W., Jiun-Lin, W., Ya-Chun, W., Fung-Wang, S., & Chuang, C. (2010). Modelling the Impact of Climate Variability on Diarrhea-associated Diseases in Taiwan (1996-2007), *Science of the Total Environment, 409*(1), 43-51.

Carlton, E. J., Eisenberg, J., Goldstick, J. , William, C., James, T., & Levy, k. (2013). Heavy Rainfall Events and Diarrhea Incidence: The Role of Social and Environmental Factors, *American Journal of Epidemiology, 179*(3), 344-352.

Devi, N. P. & Jauhari, R.K. (2006). Climatic Variables and Malaria Incidence in Dehradun, Uttaranchal, India, *Vector Borne Disease, March, 43*(1), 21-28.

Dogra, N., & Srivastav, S. (2012*). Climate change and Disease dynamics in India.* New Delhi: The Energy and Resources institute (TERI), Teri Press

Dhiman, C. Ramesh, Pahwa, S., Dhillon, P., & Dash, P. A. (2010). Climate change and threat of vector-borne diseases in India: are we prepared? *Parasitology Research, 106*(4), 763-773.

Dhara, V. R., Schramm, P. J. & Luber, G. (2013). Climate Changes and Infectious Diseases in India: Implications for Health Care providers, *The Indian Journal of Medical Research, 138*(6), 847-852.

El-Fadel, M., Ghanimeh, S., Maroun, R., & Alameddine, I. (2012). Climate change and temperature rise: Implications on food-and water-borne diseases. *Science of the Total Environment*, *437*, 15-21.

Garg, A., Dhiman, R. C., Bhattacharya, S., & Shukla, P. R. (2009). Development, Malaria and Adaptation to Climate Change: A Case Study from India, *Environmental Management, 43*(5), 779-789.

Giang, P. N., Dung Do, V., Giang, H. K., Van Vinh, B., & Rocklo, J. (2014). The effect of temperature on cardiovascular disease hospital admissions among elderly people in Thai Nguyen Province, Vietnam, *Global health Action, 7*(23649).

Haines, A. (1991). Global warming and health. *British Medical Journal, 302* (6678), 669-670.

Haines, A., McMichael, A.J., & Epstein, P. R. (2000). Environment and health: Global climate change and health, *Journal of Canadian Medical Association, 163*(6), 729-734.

Hales, S., Wet, N., Maindonald, J., & Woodward, A. (2002, September 14). *Potential Effect of Population and Climate Change on Global Distribution of Dengue Fever*, *360*(9336), 830-834.

Haines, A., & McMichael, A. J. (1997). Climate Change and Health: Implications for Research, Monitoring, and Policy, *British Medical Journal, 315,* (7112), 870-874.

Jetten, T.H, & Focks, D.A (1997). Potential Changes in the Distribution of Dengue Transmission under Climate Warming, *American Journal of Medicine and Hygiene, 57*(3), 285-297.

Khasnis, A., & Nettleman, M. D. (2005). Global Warming and Infectious Disease, *Archives of Medical Research, 36* (6), 689–696.

Kovats, R. S., & Haines, A. (2005). Global climate change and health: recent findings and future steps, *Canadian Medical Association journal, 172*(4), 501–502.

Kazma, S., Toshiki, A., Watanabe, T., Priyantha, R., Gunawardhana, L., & Amano, A. (2012*),* A Quantitative Risk Assessment of Water Borne Infectious Diseases in the Inundation area of Tropical Monsoon Region, *Journal of Sustainability Science, 7*(1), 45-54.

Lipp, K. E., Haq, A., & Colwell, R. (2002). Effects of Global Climate Change on Infectious Disease: The Cholera Model, *Clinical Microbiological Review, 15*(4), 757-770.

Lin, H., Zhang, Y., Xu, y., Xu, X., Liu, T., Luo, Y., Xiao, X., Wu, W., Ma, W. (2013). Temperature Changes between Neighboring Days and Mortality in Summer: A Distributed Lag Non-Linear Time Series Analysis. *PLoS ONE 8*(6): e66403.

Larson, B. A. (2013). Calculating disability-adjusted-life-years lost (DALYs) in discrete-time. *Cost Effectiveness and Resource Allocation*, *11*(1), 1-6.

Liu, Z., Zhang, F., Zhang, Y., Li, J., Liu, X., Ding, G., & Jiang, B. (2018). Association between floods and infectious diarrhea and their effect modifiers in Hunan province, China: a two-stage model. *Science of the Total Environment*, *626*, 630-637.

Martens, W. J., Niessen, L. W., Rotmans, J., Jetten, T. H., & Mc Michael, A. J. (1995) Potential Impact of Global Climate Change on Malaria risk: *Environmental Health Perspectives, 103* (5), 458-464.

Mc Michael, A. J., & Githeko, A. (2001). Human Health. Climate Change: Impacts, Adaptation, and Vulnerability—Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, 463-67.

Mondal, N.C, Biswas, R., & Manna. A (2001). Risk factors of diarrhea among flood victims: a controlled epidemiological Study, *Indian Journal of Public Health, 45*(4), 122-127.

Majra, J. P., & Gur, A. (2009). Climate change and health: Why should India be concerned? *Indian Journal of Occupational and Environmental Medicine, 13* (1), 11-16.

Markandya, A., & Chiabai, A. (2009). Valuing Climate Chang Impacts on Human Health: Empirical Evidence from the Literature, *International Journal of Environmental Research and Public Health, 6*(2), 759-786.

McMichael, A. J., & Haines, A. (1997). Global climate change: the potential effects on health, *British Medical Journal, 315* (7111), 805-809.

Murray, C. J., & Acharya, A. K. (1997). Understanding DALYs. *Journal of Health Economics*, *16*(6), 703-730.

McMichael, A.J., Cambell-Lendrum, D.H., Corvlan, C.F., Ebi, K.L., Getheko, E. L., Scheraga, J. D., & Woodward, A. (2003). *Climate Change and Human Health, Risks and responses. Geneva, Switzerland: World Health organization.*

Moreno, A. R. (2006). Climate change and human health in Latin America: drivers, effects, and policies, *Regional Environmental Change, 6*(3), 157-164.

Moors, E., Singh, T., Siderius, C., Balkrishnan, S., & Mishra, A. (2013). Climate Change and Water Borne Diarrhea in Northern India: Impact and Adaptation Strategies, *Science of Total Environment, 468,* S139-S151.

Moghadamnia, M. T., Ardalan, A., Mesdaghinia, A., Keshtkar, A., Naddafi, K., & Yekaninejad, M. S. (2017). Ambient Temperature and Cardio Vascular Mortality: A Systematic Review and Meta Analysis, *Peer Journal, 3574.*

Mall, R. K., Singh, N., Prasad, R., Tompkins, A., & Gupta, A. (2017). Impact of climate variability on human health: A pilot study in tertiary care hospital of Eastern Uttar Pradesh, India. *Mausam*, *68*(3), 429-438.

Mohanty, S. K., Dubey, M., Mishra, U.S., Sahoo, U. (2020). Impact of Covid-19 Attributable Deaths on Longevity, Premature Mortality and DALY: Estimates of USA, Italy, Germany and Sweden, *Global Journal of Medical Research*, 20 (9).

Paz, S. (2020). Climate change impacts on vector-borne diseases in Europe: Risks, predictions and actions, *The Lancet Regional Health-Europe*, 1(2021), 1-2

Rueda, L. M., Patel, K. J., Axtell, R. C., & Stinner, R.C. (1990). Temperature Dependent Development and Survival Rates of Aedes aegypti, *Journal of Medical Entomology, 27*(5), 892-898.

Rose, B. Joan, E., Paul, R., Lipp, K., Sherman, E., Benjamin, H., Bernad, M. S., & Patz, A. J. (2001), *Environmental Health Perspectives, 109*, 211-221.

Rocklov, J., & Durbow, R. (2020). Climate Change and Viral Emergence: Evidence from Aedes-Borne Aboviruses, *Current Opinion of Virology, 40,* 41-47.

Smoyer, K., Rainham, D. & Hewko, J. (2000) Heat-stress-related mortality in five cities in Southern Ontario: 1980–1996. *International Journal of Biometeorology, 44*, 190–197.

Sharma, E., Chettri, N., Karma Tse-ring, K., Shrestha, A.B., Jing, F., Mool, P., & Eriksson, M. (2009). Climate Change Impacts and Vulnerability in the Eastern Himalayas, ICIMOD, Kathmandu, Nepal. Project: Biodiversity and Climate Change Vulnerability Assessment in the Eastern Himalayas

Singh, K. P., & Dhiman, C. R. (2012). Climate Change and Human Health: Indian Context, *Journal of Vector Borne Diseases, 49*(2), 55–60.

Singh, A., & Purohit, M. B., (2014). Public Health Impacts of Global Warming and Climate Change, *Peace Review, A Journal of Social Justice, 26*(1), 112-120.

Swain, S., Bhatt, M., Biswal, D., Pati, S., & Ricardo, J. S. (2020). Risk Factors for Dengue outbreak in Odisha, India: A case control Study, *Journal of Infection and Public Health, 13* (4), 625-631.

Tsai, H. T., & Liu, T. M. (2005, June 21-23.). Effects of global climate change on disease Epidemics and social instability around the world, an International Workshop on Human Security and Climate Change. Retrieved from http://www.harep.org/Agriculture/HTingTsai.pdf. (Accessed on 12 April, 2020)

The Lancet (2015). Health and Climate Change: Policy Responses to protect Public Health, Vol. 386, (10006).

Vanderwal, T., & Paulton, R. (2000). Malaria in the Limbe River Valley at Northern Haiti: A Hospital Based Retrospective Study, *American Journal of Public Health*, 7(3), 162-167.

Woodward, A. (2019). Climate change: Disruption, risk and opportunity, *Global Transitions 1, (2019)*, 44-49.

Zaidi, A. K. M., Awasthi, S. & deSilva, H. (2004). Burden of Infectious Diseases in South East Asia, *British Medical Journal, 328*(7443), 811-815.

Impact of Macroeconomic Shocks in Indian Economy:
A Relook at the Okun's Law

Parimal Ghosh
Abhishek Dutta
Maniklal Adhikary

Abstract

The study investigates Okun's law for India based on monthly and quarterly data from the fourth quarter of 2015-16 to the second quarter of 2021-22, a period marked by key structural changes in the form of demonetization, introduction of Goods and Services Tax, and the COVID 19 pandemic. Our analysis finds both GDP and unemployment are level stationary and there exists unidirectional causality from GDP to unemployment. Based on the OLS method of estimation, Okun's coefficient for the period is found to be 0.146 which implies that a 1% change in GDP reduces unemployment by 0.146 per cent. After the outbreak of COVID 19 not only there is an increase in unemployment but also the responsiveness of unemployment due to change in GDP is reduced. The reason for this decreased responsiveness can be attributed to informalization of the economy and simultaneous increases in poverty and inequality. The impulse response function of unemployment due to shocks in GDP displays a wave-like pattern which indicates insufficient evidence of a declining trend of the shocks of GDP on unemployment. The Granger causality suggests we restrict the causation from unemployment to GDP which forms a dwindling pattern of the impulse response function thereby forecasting that the effect of shocks of GDP on unemployment gradually diminishes over

_____
Parimal Ghosh, Research Scholar in Economics, Burdwan University, Burdwan, West Bengal.
Email: ghoshparimal5@gmail.com

Abhishek Dutta, Research Scholar in Economics, Burdwan University, Burdwan, West Bengal.
Email; abhidtt5@gmail.com

Maniklal Adhikary, Professor of Economics, Burdwan University, Burdwan, West Bengal.
Email: drmaniklaladhikary@gmail.com

the upcoming 10 quarters. The impulse response function from VAR using monthly data forms an inverted U-shaped reaction thereby depicting that unemployment rises as a result of GDP shocks, reaches a peak, and then progressively declines as the effect of shocks on unemployment diminishes.

Keywords: Okun's law, COVID 19, Granger Causality, VAR model, Impulse Response Function.

Introduction

The main objective of macroeconomic policy is to accelerate economic growth which is mainly achieved through the expansion of output which impacts several macroeconomic variables. A key question in this context is whether output expansion always leads to increased employment. According to Abubakar and Nurudeen (2019), the expansion or contraction of unemployment is contingent upon the pace of output growth such that if output grows rapidly, unemployment will reduce and vice versa. Arthur Melvin Okun in 1962 was the first to put forward in a simple stylised fact that there is a tight negative short-run relationship between economic output and the rate of unemployment. This is called the Okun's law or perhaps more accurately Okun's rule of thumb. According to the law, there is an inverse non-proportionate relationship between output and unemployment. Okun used the US quarterly data from 1947 to 1960s and generated a rule stating that for every 1 per cent increase in the unemployment rate there would be an increase in 3 per cent gap between potential GDP and actual GDP. According to Pizzo (2020), the context of Okun's law is a tool to capture the demand driven fluctuations in an economy such that in the prevalence of low demand, firms cut back on their production by reducing both the hours per worker and number of workers, increasing unemployment. However, Akram et al. (2014) observe that Okun's law is used as a scale for measuring the cost of unemployment. Thus, Okun's law also captures the supply side fluctuations because a greater number of unemployed workers would reduce the firm's production.

The empirical validity of Okun's law has been tested by many studies, but its validity come into question during the period of macroeconomic turmoil such as jobless growth and the Great Recession. The normal questioning of Okun's law is valid in the short-run in case of the advanced countries but the coefficient changes across countries and the law is different in crisis and in normal times.

Based on this background, the purpose of this paper is to provide a reconsideration of Okun's law for India between the fourth quarter of 2015-2016 to the second quarter of 2021-2022. This period experienced some major structural changes in the economy in the form of demonetization, introduction of Goods and Services Tax, and the outbreak of the COVID 19 pandemic. With over 235 million people

infected and over 6 million people dying, COVID 19 has wreaked havoc on the economy and social system. To reduce the impact of COVID 19 especially on the health facilities, many national governments responded by imposing local or nationwide lockdowns. As a consequence, economic sectors were either partially or completely dormant. These subsequent economic repercussions mandated the government to enact a variety of monetary to fiscal measures. As part of monetary actions, the central bank has eased liquidity constraints by reducing the interest rates and has deferred credit payments of individuals and businesses. The government also designed immediate fiscal reliefs for businesses and people. The firms tend to reduce their employees thus adding to unemployment in the labour market. These shocks can be categorized as demand and supply shocks and this motivates us to test the intensity as well as the direction of association between the output and unemployment of the Indian economy in the context of these structural changes.

Review of Literature

The review of literature starts with different versions of Okun's law followed by an analysis of empirical studies relating to India. In the last few decades, efforts have been made to calculate the value of Okun's coefficient using different versions. Every approach has its advantages and drawbacks. The difference version approach is simple and is based entirely on the statistical data whereas the other approaches are contingent on some assumptions.

The Difference Version Approach: This relates GDP growth to the change in the unemployment rate and can be empirically expressed as:

$$U_t - U_{t-1} = \alpha + \beta(Y_t - Y_{t-1}) + \varepsilon_t$$

Where U_t refers to the unemployment rate in period t and U_{t-1} is the unemployment rate in period t-1. Similarly, Y_t and Y_{t-1} refer to GDP growth during the period of t and t-1. ε_t refers to the error term. β refers to Okun's coefficient and measures the degree of responsiveness of the unemployment rate due to GDP growth. The sign of the coefficient is expected to be negative so that there is a negative correlation between GDP growth and the unemployment rate. In the original Okun's version, the estimate of the coefficient β was found to be -0.03.

The Gap Version Approach: Here the difference of actual unemployment from its natural value is a negative function of production gap, i.e., the difference between actual and long-run output, and is presented by the following functional form:
Unemployment gap = β (output gap)
For estimating the Okun's coefficient β, the following gap version model is:

$$U_t - U_t^* = \alpha + \beta(Y_t - Y_t^*) + \varepsilon_t$$

Where U_t^* and Y_t^*, respectively, denote the natural rate of unemployment and potential output of an economy. The gap version of

Okun's law requires the determination of the natural rate of unemployment and the potential output of an economy. There is no agreement on the best-suited technique but the most adopted ones in the literature include the Hodrick Prescott filter and the Kalman filter (Pizzo, 2019). Okun's coefficient sums up the firms' adjustment process in response to the higher or lower level of potential output of an economy.

The Dynamic Version Approach: This assumes that the current level of unemployment depends on the current as well as the past level of output. As suggested by Knotek (2007), the right-side panel of the dynamic version includes not only the past level of output but also the past levels of unemployment. The limitation of the dynamic model is based on its complicated interpretation compared to the previous two approaches. The structure of the dynamic version can be described by the equation:

$$U_t = \beta_0 + \beta_p Y_{t-p} + \theta_q U_{t-q}$$

Where 'p' and 'q' are the lag lengths usually chosen by AIC or SIC criterion.

Production Function Version Approach: According to Prachowny (1993), in this approach the output of an economy is a function of the inputs required for the process of production such as labour, capital, and technology. The empirical function is as follows:

$$Y = \alpha(k+c) + \beta(\gamma n + \delta h) + \tau$$

Where Y is the output, k is the input of capital, c is the rate of utilization, n is the number of workers and h represents the hours of work. γ and δ respectively denote the contribution of workers and the total hours of work of the labour force. α and β represent the input elasticities of capital and labour. τ is the disembodied technology factor.

At the empirical level, there have been several studies that investigate Okun's law for different economies. However, the empirical studies testing Okun's law in the Indian context are scanty. Abubkar and Narudeen (2019) use annual time series data for India during the period of 1991- 2017 to test both the linear and non-linear relationships between unemployment and GDP. They considered two different measures of both unemployment and output: for unemployment: unemployment as a percentage of the total labour force and youth unemployment; and for output: gross national income and GDP growth rate. As all the time series variables of the study were stationary at levels, the long-run relationship was first tested using the basic ordinary least squares (OLS) techniques and second by the Markov chain regime-switching regression model. The linear model suggests that an increase in output leads to a decrease in unemployment by 0.044 per cent. In another study based on annual time series data, Ahmad Bhat et al. (2019) investigate Okun's law for the period 1983-2013. The analysis is carried out in three different steps. At first, the study tests the presence of unit roots of the variables using the Augmented Dickey-Fuller and the Phillips-Perron

test. The GDP series was found stationary at levels and the unemployment was found to contain one unit root. Further, they establish a long-run cointegration between GDP and unemployment using the Johansen-Juselius technique. Thereafter, the vector error correction model was adopted to determine the causal relationship. The study finds only a short-run causality between GDP and unemployment. The empirical finding of the paper confirms Okun's law in the case of the Indian economy and it found that a 1 per cent increase in GDP would reduce unemployment by 0.47 per cent. Another study by Das and Mukherjee (2020) suggested a negative relation between the unemployment rate and real GDP growth rate for India based on quarterly time-series data during the period of 2008-17. However, one may question the robustness of this result, as the estimation is based on simple OLS method without the much-needed relevant venture into the time-series properties of the data. Lal et al. (2012) used the gap model to find a negative relationship between the output gap and unemployment gap for India during the period 1980-2006. Based on an annual time series data, the study applies the Engle-Granger cointegration technique to find out a long-run relationship between the variables. On deciding upon the order of integration, the long-run elasticity measured by Fully Modified OLS suggested that the Okun's coefficient of the gap model in India was -0.29.

Okun's Law in a Period of Crisis

The economic variables used to formulate Okun's law are prone to some distortions due to the unpredictable behaviour of economic agents in an unstable economic environment. In Okun's law, unemployment responses to the change in output causing asymmetrical representation when transitioning between expansionary and recessionary cycles of the economy. Recent research on this topic questions the robustness of the relationship by focusing on country heterogeneity, stability of parameters and the linearity of Okun's law. The structural parameters of Okun's coefficient have been tested by various authors such as (River) Huang & Lin (2006), Owyang and Sekhposyan (2012) and Osterholm (2015). The impact of a fundamental structural change in the form of great recession (2007-09) in the US economy is critical in testing the validity of the Okun's law. One of the puzzles post-great recession period is to study the connection between labour market and output market in the form of exploring the behaviour of unemployment rate and real output growth.

Mussida and Zanin (2022) investigate Okun's law for nine European countries during the period 1985-2020 with a special focus on the COVID 19. The study finds a heterogenous impact of the pandemic on the Okun's coefficient with five among the nine countries bearing the maximum effect of the shock. A reduction in the magnitude of Okun's coefficient due to the pandemic is found for the countries of Italy, Spain, France, Austria and UK.

Econometric Model, Methodology and Data

This is a time-series study and hence it is mandatory to check the stationarity of the variables under consideration. We rely on three different unit root tests to check the robustness of our results. The methodology of each testing procedure is described below.

Unit Root Test
Augmented Dickey-Fuller (ADF) Test

To check the stationarity of Y_t series, ADF test consists of estimating the following regression.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \epsilon_t$$

where ϵ_t is a pure white noise error term and m is the number of lag lengths. For checking stationarity, we shall test the null hypothesis, $H_0: \delta = 0$, against the alternative hypothesis, $H_1: \delta \neq 0$. Dickey and Fuller have shown that under the null hypothesis $\delta = 0$, the estimated t value of the coefficient of Y_{t-1} follows τ statistic. Dickey and Fuller have computed critical values of τ statistic based on the Monte Carlo simulation experiment. MacKinnon also has prepared more extensive tables for critical values. If null hypothesis $\delta = 0$ is rejected, then there is no unit root and Y_t series is stationary.

Phillips-Perron (PP) Test

PP test is a non-parametric test developed by Phillips and Perron (1988) which controls serial correlation when testing for a unit root. The PP test modified t ratio of δ coefficient obtained from non-augmented DF test equation so that serial correlation does not affect the asymptotic distribution of the test statistic.

Non-augmented Dicky Fuller unit root equation:
$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \epsilon_t$$
Where $\delta = \alpha - 1$ (α is the obtained from AR (1) process of Y_t)
Null Hypothesis: $H_0: \delta = 0,$
Alternative Hypothesis: $H_1: \delta < 0$

t ratio for δ : $\qquad t_\delta = \frac{\hat{\delta}}{se(\hat{\delta})}$

Phillips-Perron modified t ratio for δ :

$$\tilde{t}_\delta = t_\delta \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)\left(se(\hat{\delta})\right)}{2f_0^{1/2} s}$$

Where, $\gamma_0 = $ consistent estimate of the error variance
$\quad f_0 = $ estimator of the residual spectrum at frequency zero
$\quad s = $ standard error of the test regression

The asymptotic distribution of the PP modified t ratio is akin to the ADF statistic. Therefore, MacKinnon's critical values can be considered.

Kwiatkowski, Phillips, Schmidt, And Shin (KPSS) Test

According to Kwiatkowski et al., (1992) the test is based on residuals from OLS regression of dependent variable on the exogenous variable. The Null hypothesis of the KPSS test differs from other unit root tests in the respect that it assumes that the series is stationary.

OLS Regression: $\quad\quad\quad y_t = x_t'\beta + u_t$

Where x_t contains exogenous regressors.

LM statistic: $\quad\quad\quad LM = \frac{\sum_t s(t)^2}{T^2 f_0}$

Where cumulative residual function, $\quad s(t) = \sum_{r=1}^{t} u_r$

f_0 = estimator of the residual spectrum at frequency zero

The KPSS critical values for the LM test statistic are based upon the asymptotic results.

Perron (1989, 1997) Break Point Unit Root Test

Perron (1989) questioned Nelson and Plosser's (1982) broad consensus that most macroeconomic variables are characterised by unit root processes (1989). He believed that the presence of a break point in a macroeconomic time series causes unit root processes. Generic unit root tests are frequently unable to reject the null of unit root in the presence of structural break points. As a result, stationary time series could appear to be nonstationary. Furthermore, according to Perron (1989), macroeconomic variables sim ply follow a trend stat-ionary process with a break point. Unlike Perron (1989), the break point in Perron (1997) was endogenous.

Before Proceeding let us define some variables. Suppose T_b is a break point.

Intercept break, $DU_t(T_b) = 1$ for $t \geq T_b$
$\quad\quad\quad\quad\quad\quad = 0 \quad$ Otherwise
Trend break, $DT_t(T_b) = t - T_b + 1 \quad$ for $t \geq T_b$
$\quad\quad\quad\quad\quad\quad = 0 \quad$ Otherwise
One-time break, $D_t(T_b) = 1$ for $t = T_b$
$\quad\quad\quad\quad\quad\quad = 0 \quad$ Otherwise

Perron (1989) considered two approaches to model break dynamics, namely innovative outlier and additive outlier.

Innovative Outlier Model:

Null Hypothesis:
$$y_t = \beta + y_{t-1} + \psi(L)(\theta D_t(T_b) + \gamma DU_t(T_b) + \epsilon_t)$$

Where, ϵ_t = i.i.d. innovations, $\psi(L)$ = lag polynomial representing the dynamics of the stationary and invertible ARMA error process. Break variables enter the model with the same dynamics as the ϵ_t innovations.

Alternative Hypothesis: It is assumed that process is trend stationary with break in trend and intercept.
$$y_t = \mu + \beta t + +\psi(L)(\theta DU_t(T_b) + \gamma DT_t(T_b) + \epsilon_t)$$

Breaks again following the innovation dynamics.

We may construct a general Dickey-Fuller test equation:

$$y_t = \mu + \beta t + \theta DU_t(T_b) + \gamma DT_t(T_b) + \omega D_t(T_b) + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i}$$
$$+ u_t$$

We can use the t-statistic for inference purpose of $\hat{\alpha}$. As with conventional Dickey-Fuller unit root test equations, the lagged differences are included in the test equations to eliminate the effect of the error correlation structure on the asymptotic distribution of the statistic.

Zivot and Andrews (1992) Test

It is similar but slightly different from Perron's test. Zivot Andrews test does not nest the null and alternatives, as $DU_t(T_b)$ is absent from the test equation that is the model considers trend with trend break. Therefore the methodology for Zivot and Andrews (1992) test becomes as follows.

$$y_t = \mu + \beta t + \gamma DT_t(T_b) + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + u_t$$

The break date is selected where the t statistic from the ADF test is a minimum.

Since the direction of causation between output and unemployment is confirmed by the Granger Causality test we proceed as follows:

Granger Causality

Granger (1969) developed a causality test amongst stationary variables or non-stationary but cointegrated variables.

$$y_t = \alpha_0 + \sum_{i=1}^{l} \alpha_i y_{t-i} + \sum_{i=1}^{l} \beta_i x_{t-i} + \epsilon_t$$
$$x_t = \gamma_0 + \sum_{i=1}^{l} \gamma_i x_{t-i} + \sum_{i=1}^{l} \delta_i y_{t-i} + \epsilon_t$$

Where l = optimum number of lag

Based on the equations, the null hypothesis to test whether x Granger causes y is

$$H_0: \beta_1 = \beta_2 = \cdots = \beta_l = 0$$

And to test whether y Granger causes x Null Hypothesis is as follows.

$$H_0: \delta_1 = \delta_2 = \cdots = \delta_l = 0$$

The results based on the Granger causality would help to build the model to determine Okun's coefficient. Based on our objectives, we construct three different models.

Model 1: $\qquad\qquad U = \alpha + \beta \ln GDP + \varepsilon$

Where U is unemployment rate (%)

Now from this lin-log model if we want to calculate the percentage change of unemployment due to one percent change of GDP we have to divide β by 100 since unemployment is already in percentage.

Here, our parameter of interest is β. Our null hypothesis is $H_0: \beta = 0$ which is to be tested against the alternative hypothesis $H_1: \beta \neq 0$.

Model 2: $$U = \alpha + \gamma D + \beta \ln GDP + \varepsilon$$
Where dummy, $D = 1$ from 2019-20 Q4
$$= 0 \text{ for previous period}$$

Model 2 would help us to see how the onset of the pandemic has affected the unemployment situation in India.

The conditional mean unemployment rate for the period before 2019-20 Q4:

$$E(U|D = 0) = \alpha + \beta \ln GDP$$

The conditional mean unemployment rate for the period after 2019-20 Q4:

$$E(U|D = 1) = (\alpha + \gamma) + \beta \ln GDP$$

Where γ is the differential intercept coefficient. The condition, $\gamma > 0$ implies that the intercept of Okun's law has been increased i.e. unemployment has increased after COVID 19. The reverse is the case when $\gamma < 0$.

Model 3: $$U = \alpha + \beta \ln GDP + \delta(D * \ln GDP) + \varepsilon$$
The conditional mean unemployment rate for the period before 2019-20 Q4:

$$E(U|D = 0) = \alpha + \beta \ln GDP$$

The conditional mean unemployment rate for the period after 2019-20 Q4:

$$E(U|D = 1) = \alpha + (\beta + \delta) \ln GDP$$

Where δ is the differential slope coefficient. Sign and the magnitude of δ determine the responsiveness of the unemployment rate due to change in GDP. Therefore we can directly test whether the slope of Okun's law has been changed after COVID 19 shocks or not i.e. whether responsiveness of unemployment rate due to change of GDP has been changed after COVID 19 or not. The condition, $\delta > 0$ implies that the responsiveness of the unemployment rate due to the change of GDP has been increased after COVID 19 and responsiveness decreases in case of $\delta < 0$.

The effect of shocks such as that of COVID 19 can be better accounted for by Vector Autoregression (VAR) model. The details are described as:

Vector Autoregression (VAR)

In VAR all variables are endogenous and treat all variables symmetrically. Impulse Response Functions (IRF) derived from VAR show the responses of variables due to the shocks from other variables and therefore VAR system allows us to examine the effect of COVID 19 shocks on variables. Particularly, our interest is to examine the effect of GDP shocks unemployment which is in line with Okun's law and COVID 19 shocks. Now two variables primitive VAR model with lag one can be described as follows.

$$Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$$

Where,

matrix $B = \begin{pmatrix} 1 & b_{12} \\ b_{21} & 1 \end{pmatrix}$, vector $x_t = \begin{pmatrix} Un \\ \ln GDP \end{pmatrix}$, vector $\Gamma_0 = \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix}$

matrix $\Gamma_1 = \begin{pmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{pmatrix}$, and Vector $\varepsilon_t = \begin{pmatrix} \varepsilon_{Un} \\ \varepsilon_{\ln GDP} \end{pmatrix}$

In the Primitive VAR system, unemployment has a contemporaneous effect on GDP and GDP has a contemporaneous effect on unemployment. As a result, the OLS estimate suffers from simultaneous equation bias since regressor and error term would be correlated. Therefore, we need to transform the primitive VAR into standard VAR by pre multiplying B^{-1}. The standard model can be written as follows.

$$x_t = A_0 + A_0 x_{t-1} + e_t$$
$$\text{Where,} \quad A_0 = B^{-1}\Gamma_0, \quad A_1 = B^{-1}\Gamma_1 \text{ and } e_t = B^{-1}\varepsilon_t$$

Following this general VAR model, the particular VAR model for the estimation purpose of our study is as follows:

$$Un = a_{10} + a_{11} Un_{t-1} + a_{12} \ln GDP_{t-1} + e_{1t}$$
$$\ln GDP = a_{20} + a_{21} Un_{t-1} + a_{22} \ln GDP_{t-1} + e_{2t}$$

Where, a_{io} is i^{th} element of vector A_0 and a_{ij} is ij^{th} element of matrix A_1.

To identify the parameters of the primitive VAR model from the standard VAR model one restriction is imposed. Choleski decomposition restricts the B matrix such that $b_{21} = 0$ which implies that unemployment has no contemporaneous effect on ln GDP.

Restricted VAR Model

Granger causality test suggests that there is no causality from unemployment to ln GDP. So, to reduce the overparameterization the restriction $a_{21} = 0$ can be imposed. Therefore, the restricted VAR (1) model becomes as follows.

$$Un = a_{10} + a_{11} Un_{t-1} + a_{12} \ln GDP_{t-1} + e_{1t}$$
$$\ln GDP = a_{20} + a_{22} \ln GDP_{t-1} + e_{2t}$$

Impulse Response Function (IRF)

Vector autoregression (VAR) can be represented in vector moving average (VMA) form and can be written as follows.

$$\begin{pmatrix} Un \\ \ln GDP \end{pmatrix} = \begin{pmatrix} \overline{Un} \\ \overline{\ln GDP} \end{pmatrix} + \sum_{i=0}^{\infty} \begin{pmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{pmatrix} \begin{pmatrix} \varepsilon_{Unt-i} \\ \varepsilon_{lnGDPt-i} \end{pmatrix}$$

$\phi_{ij}(i)$ are called impulse response functions which are plotted against i. n period ahead cumulated sum of the effect of GDP shocks on Unemployment is $\sum_{i=0}^{n} \phi_{12}(i)$

Cubic spline interpolation has been used to generate monthly data from quarterly data. Methodology of cubic interpolation is as follows.

Cubic Spline Interpolation

Given (x_0, y_0), (x_1, y_1), ..., (x_{n-1}, y_{n-1}), (x_n, y_n) data points, we need to estimate y for given values of x. The problem is called interpolation when $x_0 \leq x \leq x_n$; the problem becomes extrapolation when $x < x_0$ or $x > x_n$. Now basically the problem of interpolation is to draw a smooth curve through the given $n + 1$ points.

More widely used interpolation is the piecewise polynomial interpolation. Most popular piecewise polynomial interpolation is linear and cubic spline interpolation. With $n + 1$ number of data points we can draw n number of piecewise polynomials. The basic methodology of cubic spline interpolation is as follows.
we define piecewise cubic polynomials by
$g_i(x) = a_i(x - x_i)^3 + b_i(x - x_i)^2 + c_i(x - x_i) + d_i$ for $i = 0$ to $n - 1$ and $x_i \leq x \leq x_{i+1}$
Each n polynomials go through two connecting points resulting in following constraints
$$g_i(x_i) = y_i \text{ and } g_i(x_{i+1}) = y_{i+1} \text{ for } i = 0 \text{ to } n - 1$$

To achieve a smooth interpolation, we further require the first and second derivatives at each joining point to be same for two successive polynomials which results the constraints
$$g_i'(x_{i+1}) = g_{i+1}'(x_{i+1}) \text{ and } g_i''(x_{i+1}) = g_{i+1}''(x_{i+1}) \text{ for } i = 0 \text{ to } n - 2$$
Now, to estimate n number of cubic polynomials we need to estimate 4n number of parameters and to do so we need at least 4n number of equations. First two constraints give 2n number of equations and from second two constraints we get 2n-2 number of equations. Therefore, total number of equations equals to 4n-2. So, we need another two equations.

To get these two equations we have to impose two restrictions. There are various ways to do that, among them one is the not-a-knot condition which assumes
$$g_0(x) = g_1(x) \text{ and } g_{n-2}(x) = g_{n-1}(x)$$

Measurement and Specification of the Variables

Drawing upon the database of the Centre for Monitoring Indian Economy (CMIE) the time-series data for both the variables have been collected for India and the period that is being examined is from the fourth quarter of 2015-16 to the second quarter of 2021-22. Initially, we obtained the monthly figures of the unemployment data but to keep parity with the GDP variable we converted the monthly data to the quarterly data by simple average. Quarterly data is more advantageous to work with as compared to the annual data points as we can carry out the analysis with a greater number of data points thereby obtaining a stable result. The period of our analysis would allow investigating

Okun's law by considering two important economic events of demonetization and the pandemic.

According to the CMIE, unemployment rate is the percentage of the labour force who are unemployed but are willing to work and are actively looking for a job. CMIE estimates the monthly unemployment rate using the sample of 44,600 households per month and the sample is well distributed over the country. Presently, in India, GDP is measured at market prices considering the base year 2011-12.

Empirical Results and Analysis

To illustrate Okun's law in the case of the Indian economy during the period of our study figure 1 depicts a near opposite symmetrical relationship between output and unemployment; the descriptive statistics are presented in Appendix Table A1.

To test the stationarity of the variables, we perform the unit root tests, namely, ADF, PP and KPSS. Table 1 suggests that for both the unit root tests ADF and PP, the variables unemployment and GDP reject the null of non-stationarity at a 5 per cent level of significance whereas, in the case of the KPSS test, both the variables accept the null of stationarity at 1 per cent level of significance. Both GDP and unemployment variables are level stationary and thus are integrated of order 0.

Figure 1: ln GDP and Unemployment over quarters
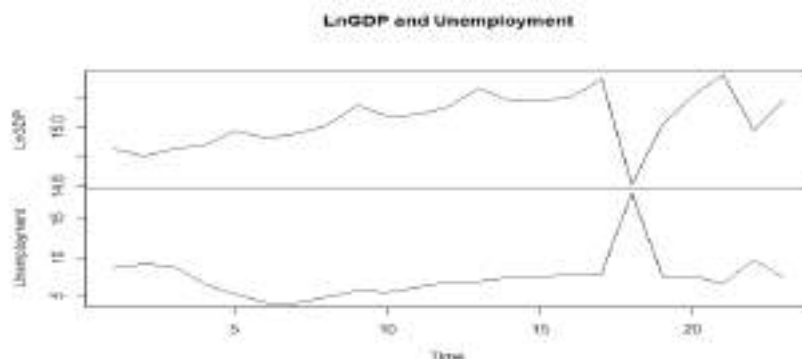
Table 1: Unit Root Test

Test Statistic	ADF	PP	KPSS
Unemployment	-3.368**	-3.368**	0.119***
Ln GDP	-4.099**	-4.077**	0.122***

Source: Authors' computation.
Note: *, **, and***denotes significance level at 10%, 5% and 1%, respectively.

As illustrated in the methodology section, the generic unit root tests may be misleading in the presence of structural break. Therefore, we perform two structural break unit root tests. From Table 2 we find that both Perron test as well as Zivot-Andrews's test conform the

stationarity of the unemployment and the LnGDP series. Both tests give break date as 2020-21 Q1 for unemployment series while the break date of the Ln GDP series is same in Zivot-Andrews's test but in case the Perron test break date appears one quarter earlier.

Table 2: Single Break Unit Root Test

Test Statistic	Perron Break Point (P)	Zivot Andrews Break Point (ZA)
Unemployment	-11.238*** 2020-21 Q1	
		-4.994*** 2020-21Q1
Ln GDP	-8.519*** 2019-20 Q4	-7.204*** 2020-21Q1

Source: Authors' computation.
Note: *, **, and***denotes significance level at 10%, 5% and 1% respectively.

The economic models testing Okun's law often face the dilemma on the direction of causation between output and unemployment. This is referred to as the simultaneous causality bias or the endogeneity problem and may cause the estimation of Okun's coefficient unreliable. Thus, it is necessary to perform the pairwise Granger causality test to choose the right dependent variable.

From the results of the Granger causality test, reported in Table 2, we find that the null ln GDP does not Granger cause GDP is rejected at 1 per cent level of significance. Therefore, there is unidirectional causality from ln GDP to unemployment. Thus, unemployment is our dependent variable and GDP is the independent variable. Based on the conclusions from Tables1 and 2, we can choose the method of estimating the Okun's coefficient for India during the period of our study. The results of Table 1 suggest that the simple OLS method will suffice as both the series are stationary at levels. Table 2 suggests we use unemployment as the dependent variable and ln GDP as the explanatory variable.

The regression results from Table 3 and 4 suggest shows that unemployment and GDP are inversely related and the relationship is significant at a 1 per cent level. The Okun's coefficient for India during the study period is -0.146 per cent. Thus, a 1 per cent decline in GDP would increase unemployment by 0.146 per cent during the period of our study.

Table 3: Pairwise Granger Causality Tests

Null Hypothesis:	Observations	F-Statistic	Prob.
ln GDP does not Granger Cause Unemployment	21	5.66490	0.0138
Unemployment does not Granger Cause lnGDP	21	0.21791	0.8065

Source: Authors' computation.

Table 4: Estimation Result of Model 1

Dependent Variable: Unemployment, Method: OLS, Observation: 23					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
Constant	226.918	92.491	2.453	0.023	
lnGDP	-14.611	6.15	-2.373	0.027	
Diagnostic Statistics					
R-squared	0.211		Adjusted R-squared	0.173	
F-statistic	5.633				
Prob (F-statistic)	0.027		DW Statistic	0.804	

Source: Authors' computation.

During our study period, there was the outbreak of COVID 19 during quarter 4 of 2019-20. This had a significant effect on the unemployment situation in India. In order to test the post-pandemic unemployment situation, we introduce an intercept dummy in the previous model as described in detail in the methodology section. The estimation results of Model 2 are displayed in Table 5. We can observe that the intercept dummy is positive and highly significant at 1 per cent level. The positive coefficient suggests an increase in unemployment after the outbreak of COVID 19. The magnitude of the increase is about 2.73 per cent.

Table 5: Estimation Result of Model 2

Dependent Variable: Unemployment, Method: OLS, Observation: 23					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
Constant	270.103	76.48542	3.531	.002	
Intercept Dummy	3.312	0.973	3.402	.002	
Ln GDP	-17.552	5.093	-3.445	.002	
Diagnostic Statistics					
R-squared	0.5		Adjusted R-squared	0.45	
F-statistic	10.025				
Prob(F-statistic)	0		DW Statistic	1.107	

Source: Authors' computation.

Now, instead of an intercept dummy, we have to use a slope dummy to find out the coefficient of Okun's law. It is evident from Table 6 that the slope dummy is positive and significant indicating that after the outbreak of COVID 19, the coefficient of Okun's law has been reduced. Before COVID 19 the coefficient was -17.660 and after the outbreak of COVID 19, the resultant coefficient becomes -17.441. Therefore, after the outbreak of COVID 19, the coefficient of Okun's law has decreased implying the reduced responsiveness of unemployment due to change in GDP. From the above regression result, we can conclude that before

COVID 19 one percent decline of GDP increased unemployment by 0.176 per cent and after COVID 19 one per cent decline of GDP increases unemployment by 0.174 per cent. The reduction of Okun's coefficient may be attributed to the factors such as the expansion of the gig economy and moonlighting which resulted in more informalization of the economy after COVID 19. Both poverty and inequality have risen after the COVID 19 outbreak. This phenomenon is indicated in many studies and it also suggests the reduction of responsiveness of unemployment to GDP change as the pandemic left a pool of potential workers out of the purview of GDP.

Table 6: Estimation Result of Model 3

Dependent Variable: Unemployment, Method: OLS, Observation: 23					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
Constant	271.727	76.791	3.538	0.002	
lnGDP	-17.66	5.114	-3.453	0.002	
Slope Dummy	0.219	0.064	3.376	0.003	
Diagnostic Statistics					
R-squared	0.497		Adjusted R-squared	0.447	
F-statistic	9.913				
Prob(F-statistic)	0.001		DW Statistic	1.109	

Source: Authors' computation.

This study requires the relationship between unemployment and GDP to be analyzed with the help of the VAR model (for results, see, Appendix) the lag specifications of which have been empirically found to be six confirmed by Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQ), Schwarz Information Criterion (SC) and Final Prediction Error Criterion (FPE). But we have only 23 observations. So, we cannot afford six lags. We have used four lags since our data are quarterly. The estimation from the VAR model is reported in Tables A2 through A5 in the appendix. From these tables, it can be observed that the parameters are insignificant. The literature on VAR suggests that insignificant parameters in VAR are not a major problem as VAR is concerned with prediction. Our interest is to look into the impulse response of unemployment due to changes in GDP shocks. The Granger causality test from VAR also suggests the unidirectional causality from GDP to unemployment (Table 7).

Figure 2 depicts the 10 periods ahead forecast of the effect of shocks from GDP on GDP itself and the effect of the same on unemployment. The same figure also displays the effect of unemployment shocks on unemployment and GDP. Here, the IRF of unemployment due to unemployment shocks is the IRF of our interest which is situated in the upper right portion of Figure 2. The response of unemployment due to

GDP shocks forms a wave-like pattern. This suggests that due to shocks in GDP, the unemployment increases first thereby declining from the second quarter itself and from the fifth quarter it starts increasing again and from sixth quarter, unemployment decline and again from the ninth quarter it starts to rise. Therefore, we cannot say anything about the trend of the response of unemployment due to GDP shocks.

Table 7: Granger Causality Test from VAR

Null Hypothesis:	d.f.	F-Statistic	Prob.
ln GDP does not Granger Cause Unemployment	(4,20)	2.66	0.062
Unemployment does not Granger Cause ln GDP	(4,20)	0.157	0.957

Source: Authors' computation.

Figure 2: Responses of Unemployment to GDP Shocks

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.
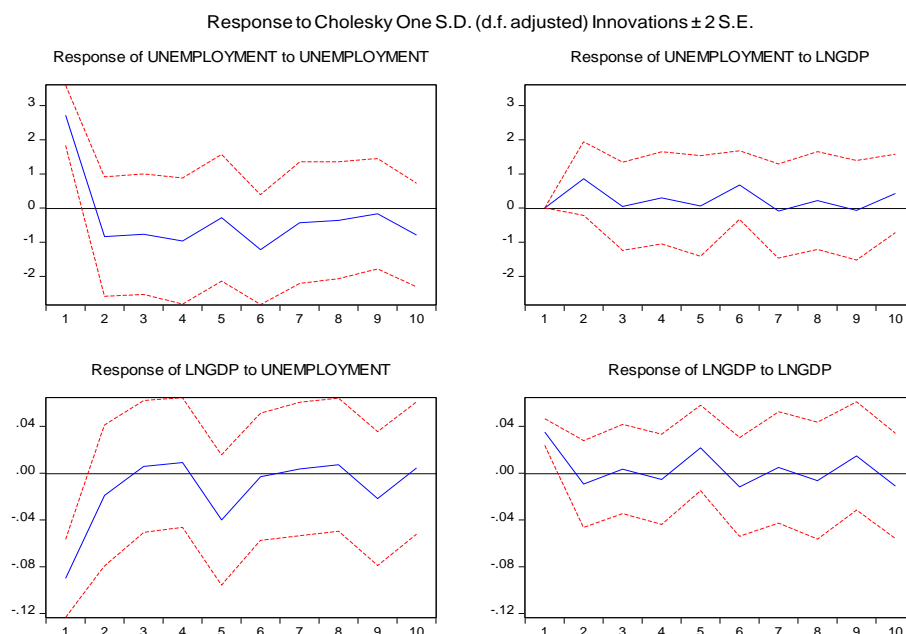
Granger causality suggests that there is no causation from unemployment to GDP. This restriction is imposed on the VAR model in order to mitigate the problem of over-parameterization. The IRFs from the restricted VAR model are given in Figure 3. IRF of restricted VAR also shows the dwindling response of unemployment to shocks of GDP. Therefore, from the above figure, we can say that initially unemployment increases due to GDP shocks but from second quarter it starts to decline and eventually the effect of shocks diminishes. The result is more pertinent as this pattern of IRF is at par with the literature of VAR.

Figure 3: Impulse Response Functions from Restricted VAR
Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.
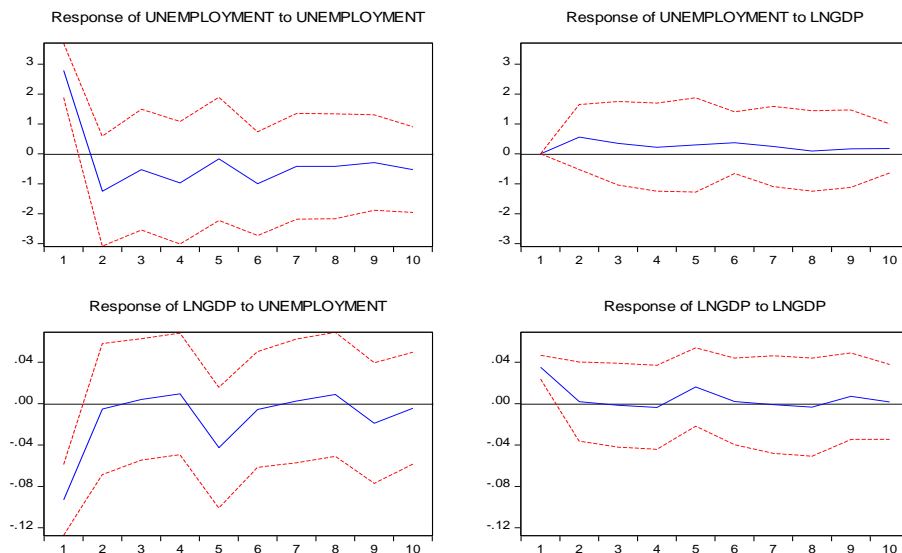
A VAR model with four lags necessitates the estimation of 18 parameters. As a result, estimating a VAR (4) model with only a few quarterly data is extremely challenging, resulting in inconsequential parameters. To address this difficulty, we used cubic spline interpolation to convert quarterly GDP to monthly GDP, resulting in a threefold increase in data points. However, in the case of unemployment data, CMIE has monthly unemployment data available. We now use the VAR model based on monthly data. The two variables used here are the growth rate of GDP and monthly unemployment. To establish stationarity, we used the growth rate of GDP instead of the level GDP[1]. The results of the VAR model using monthly data is presented in Appendix Tables A6, A7, A8 and A9.

Figure 4 depicts the IRF derived from VAR model using monthly data. The reaction of unemployment to GDP growth shocks is depicted in the upper left-hand corner of the figure. The shocks from GDP growth induce unemployment to form an inverted U-shaped reaction implying unemployment rises as a result of GDP shocks, reaches a peak, and then progressively declines as the effect of shocks on unemployment diminishes.

Similar to the quarterly analysis, here also we have restricted the VAR (4) model to reduce parameter burden such that unemployment does not Granger cause GDP. Again, shocks from GDP growth causes unemployment to give an inverted U-shaped response that is effect of shocks decreases once it reaches maximum (Figure 5).

---

[1] We also performed the VAR model with level GDP and find that the results are almost similar.

Figure 4: Responses of Unemployment to GDP Shocks Using Monthly Data

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.
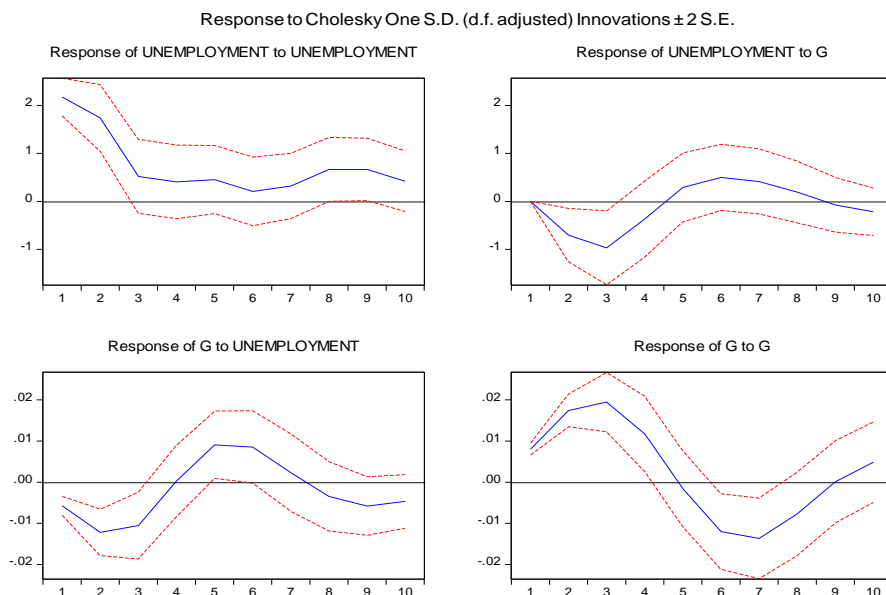
Figure 5: Impulse Response Functions from Restricted VAR Using Monthly Data

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.
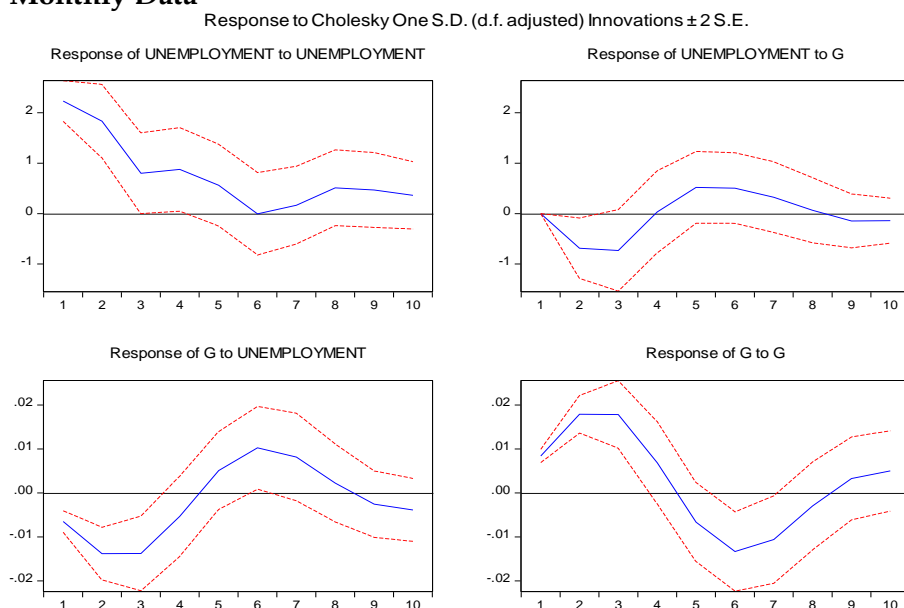
Conclusion

Okun's law is revisited in this paper for the Indian economy between the fourth quarter of 2015 -16 to the second quarter of 2021-22. During this time, the Indian economy experienced some major structural

changes in the form of demonetization, introduction of Goods and Services Tax, and outbreak of the COVID 19 pandemic. In this context, the change of unemployment with respect to output is investigated for the Indian economy both with quarterly as well as monthly data. The study uses time-series methodologies for the analysis.

Based on three different unit root tests, the study concludes that both the variables GDP and unemployment are stationary at levels. Further, GDP Granger causes unemployment but unemployment does not Granger cause GDP for the period of this study. Okun's coefficient is 0.146 implying that a 1 per cent decline of GDP increases unemployment by 0.146 per cent. Based on the previous empirical studies of Okun's law for the developing countries, the low value of Okun's coefficient in the case of India is justifiable. The findings of this research indicate that after the outbreak of COVID 19 unemployment has increased. The responsiveness of unemployment to the change GDP is found to have reduced after the COVID 19 outbreak, causes of which may be attributed to the factors like informalization of the economy, increase in poverty and inequality. The causality from VAR also suggests that there is unidirectional causality from GDP to unemployment for the period of our study. The IRF from VAR using quarterly data suggests that the response of unemployment due to the GDP shocks is forming a wave-like pattern indicating insufficient evidence of a declining trend of the shocks of GDP on unemployment. The Granger causality suggests we restrict the causation from unemployment to GDP which forms a dwindling pattern of the IRF thereby forecasting that the effect of shocks of GDP on unemployment gradually diminishes over the upcoming 10 quarters. The IRF from VAR using monthly data forms an inverted U-shaped reaction suggesting that unemployment rises as a result of GDP shocks, reaches a peak, and then progressively declines as the effect of shocks on unemployment diminishes.

References

Abubakar, J., & Nurudeen, I. (2019). Economic Growth in India, Is It a Jobless Growth? An Empirical Examination Using Okun's Law. *The Indian Journal of Labour Economic*s, 62(2), 307-317.

Ahmad BHAT, T., Ahmad LONE, T., & Mohi Ud DIN, T. (2019). The validity of Okun's Law: Evidences from Indian economy. *Theoretical And Applied Economics*, XXVI(4(621), Winter), 273-278.

Akram, M., Hussain, S., Hasan Raza, S., & Masood, S. (2014). An Empirical Estimation of Okun'S Law in Context of Pakistan. Journal Of Finance and Economics, 2(5), 173-177.

Das, P., & Mukherjee, R. (2020). Application of Okun's Law in The Economy of India During: 2008-2017. *BKGC Scholars*, 1(1), 95-103.

Granger, C. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica*, 37(3), 424.

Knotek, E. (2007). How Useful is Okun's Law. *Economic Review*, 92(Q IV), 73-103.

Kwiatkowski, D., Phillips, P., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*, 54(1-3), 159-178.

Lal, I., Muhammad, S., Jalil, M., & Hussain, A. (2010). Test of Okun's Law in Some Asian Countries Co-Integration Approach. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.1562602

Mussida, C., & Zanin, L. (2022). Okun's Law and the COVID 19 Pandemic in Europe. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4010017

Nelson, C., & Plosser, C. (1982). Trends and random walks in macroeconmic time series: Some evidence and implications. *Journal of Monetary Economics*, *10*(2), 139-162

Österholm, P. (2015). Time variation in Okun's law in Sweden. *Applied Economics Letters*, 1-4.

Owyang, M., & Sekhposyan, T. (2012). Okun's Law over the Business Cycle: Was the Great Recession All That Different? Review, 94(5).

Perron, P. (1989). The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. *Econometrica*, *57*(6), 1361-1401.

Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, *80*(2), 355-385.

Phillips, P., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika,* 75(2), 335-346.

Pizzo, A. (2020). Literature Review of Empirical Studies on Okun's Law in Latin America and the Caribbean. Employment Policy Department, Employment Working Paper No. 252, International Labour Office, Geneva.

Prachowny, M. (1993). Okun's Law: Theoretical Foundations and Revised Estimates. *The Review of Economics and Statistics*, 75(2), 331.

(River) Huang, H., & Lin, S. (2006). A flexible nonlinear inference to Okun's relationship. *Applied Economics Letters*, 13(5), 325-331.

Zivot, E., & Andrews, D. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal Of Business &Amp; Economic Statistics*, *10*(3), 251.

Appendix

Table A1: Descriptive Statistics

	Unemployment	Ln GDP
Mean	7.386	15.025
Median	7.380	15.034
Maximum	18.476	15.175
Minimum	4.006	14.807
Std. Dev.	2.856	0.089
Skewness	2.525	-0.411
Kurtosis	11.073	2.781
Jarque-Bera	86.904	0.694
Probability	0.000	0.706
Sum	169.893	345.575
Sum Sq. Dev.	179.547	0.177
Observations	23	23

Source: Authors' computation based on secondary data

Table A2: Estimation Result of lnGDP Equation

	Estimate	Std. Error	t value	Pr(>|t|)
Unemployment.l1	-0.0158	0.020	-0.764	0.462
LnGDP.l1	-0.2667	0.525	-0.507	0.623
Unemployment.l2	0.0090	0.022	0.405	0.694
LnGDP.l2	0.414	0.773	0.536	0.604
Unemployment.l3	-0.002	0.021	-0.095	0.926
LnGDP.l3	-0.214	0.792	-0.271	0.792
Unemployment.l4	0.001	0.016	0.09	0.93
LnGDP.l4	0.646	0.737	0.877	0.401
const	6.398	8.301	0.771	0.459

Source: Authors' computation based on secondary data

Table A3: Estimation Result of Unemployment Equation

	Estimate	Std. Error	t value	Pr(>|t|)
Unemployment.l1	0.5005	0.5835	0.858	0.4111
LnGDP.l1	24.4572	14.8197	1.65	0.1299
Unemployment.l2	-0.1003	0.6293	-0.159	0.8766
LnGDP.l2	-4.3459	21.8174	-0.199	0.8461
Unemployment.l3	-0.1069	0.5966	-0.179	0.8614
LnGDP.l3	6.658	22.3302	0.298	0.7717
Unemployment.l4	0.1897	0.4652	0.408	0.692
LnGDP.l4	6.117	20.7883	0.294	0.7746
const	-490.571	234.0102	-2.096	0.0625

Source: Authors' computation based on secondary data

Table A4: Covariance Matrix of Residuals

Covariance Matrix of Residuals		
	Unemployment	Ln GDP
Unemployment	7.398	-0.244
Ln GDP	-0.244	0.009

Source: Authors' computation based on secondary data

Table A5: Correlation Matrix of Residuals

Correlation Matrix of Residuals		
	Unemployment	Ln GDP
Unemployment	7.398	-0.244
LnGDP	-0.244	0.009

Source: Authors' computation based on secondary data

Table A6: Estimation Results of GDP Growth (Monthly) Equation

	Estimate	Std. Error	t value	Pr(>|t|)
Gr.l1	2.126	0.152	14.023	0.000
Unemployment.l1	-0.001	0.001	-0.899	0.373
Gr.l2	-2.339	0.323	-7.249	0.000
Unemployment.l2	0.001	0.001	1.170	0.247
Gr.l3	1.104	0.304	3.635	0.001
Unemployment.l3	-0.003	0.001	-3.387	0.001
Gr.l4	-0.170	0.150	-1.140	0.259
Unemployment.l4	0.003	0.001	3.323	0.002
const	-0.001	0.006	-0.227	0.821

Source: Authors' computation based on secondary data

Table A7: Estimation Results of Unemployment (Monthly) Equation

	Estimate	Std. Error	t value	Pr(>|t|)
Gr.l1	-115.910	22.863	-5.070	0.000
Unemployment.l1	0.547	0.133	4.107	0.000
Gr.l2	144.903	48.667	2.977	0.004
Unemployment.l2	-0.211	0.143	-1.476	0.146
Gr.l3	-95.389	45.786	-2.083	0.042
Unemployment.l3	0.493	0.145	3.394	0.001
Gr.l4	36.504	22.546	1.619	0.111
Unemployment.l4	-0.032	0.141	-0.224	0.823
const	1.558	0.875	1.781	0.080

Source: Authors' computation based on secondary data

Table A8: Covariance Matrix of Residuals

Covariance Matrix of Residuals		
	Gr.	Unemployment
Gr.	0.0001395	-0.0005221
Unemployment	-0.0005221	3.1723525

Source: Authors' computation based on secondary data

Table A9: Correlation Matrix of Residuals

Correlation Matrix of Residuals		
	Gr.	Unemployment
Gr.	1.00000	-0.02482
Unemployment	-0.02482	1.00000

Source: Authors' computation based on secondary data

Surendra Meher

Abstract

The present paper seeks to examine the employment pattern and poverty head count ratio across different social classes in rural areas of Kalahandi and Bargarh districts of Odisha with the help of primary data collected using structured questionnaire. The study noted a poorer access to gainful employment opportunities and higher poverty concentration in Kalahandi compared to Bargarh. Poverty head count ratio among Scheduled Tribes and Scheduled Castes was relatively higher in both regions. Promotion of both physical infrastructure and human capital are suggested towards creating more employment opportunities that would reduce poverty.

Keywords: Employment, Poverty, Social Groups, Consumption Expenditure, Income

Introduction

As per the report of the expert group to review the methodology for measurement of poverty (Government of India, 2014) reveals that the ratio of poverty at all India level was 29.5 per cent, while for rural areas it was 30.9 per cent, it stood at 26.4 per cent for urban areas. Further, huge variations in poverty ratio across states have been observed. States such as Goa (6.3%), Himachal Pradesh (10.9%), Punjab (11.3%), Kerala (11.3%) have lesser poverty ratio, compared to less developed states such as Chhattisgarh (47.9), Manipur (46.7%), Odisha (45.9%) and Madhya Pradesh

_____

Surendra Meher, Assistant Professor, Department of Economics, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh.
Email: surendrameher@yahoo.com

(44.3%). The state of Odisha has historically witnessed high incidence of poverty and often remained at the bottom in poverty ratio. Further, there exist wide variations within the state in terms of major socio-economic indicators. Especially, the western region of the state comprising the undivided Kalahandi, Bolangir, Koraput (KBK) districts has an extremely high incidence of poverty. The Niti Aayog (Government of India, 2021) estimated the multidimensional poverty head count ratio for Odisha at 29.46 per cent with high inter-regional variations: Malkangiri (58.71%), Navarangpur (59.32%) and Koraput (51.14%) are among the poorest districts while Puri (11.64%), Jagatsinghpur (11.83%) and Cuttack (14.97%) are the better-off ones. The head count ratio of multidimensional poverty is arrived at using several dimensions of human development such as health, education and other indicators of standard of living on the basis of NFHS-4 data of 2015-16.

Further, the Scheduled Castes (SCs) and Scheduled Tribes (STs) have remained the most economically vulnerable groups in the growth process. This has been attributed to lack of access to land and other capital resources especially by the SC households (Thorat and Deshpande, 2001). Economic position of a household also is determined by the nature of employment pursued which is influenced by the discrimination in the labour market. The present study endeavors to examine employment and poverty level across different social groups in two districts of Odisha, namely, Kalahandi and Bargarh.

Review of Literature

Poor agricultural productivity and lack of adequate employment opportunities especially in rural non-farm sector are among the prominent reasons for high poverty ratio in the state compared to other states (Nanda et.al., 2011; Reddy, 2012). As per the 2011 Census, 85.01 per cent of the total population of the state lives in rural areas. Agriculture has been the mainstay of state's economy as it contributes nearly one-fourth of the net state domestic product and provides employment to more than 60 per cent of the total work force (Government of Odisha, 2018). However, agriculture has not been a remunerative proposition due to inadequate infrastructure especially irrigation and improper input mix. Majority of them are small farmers and only a few are producing for the market. With limited employment opportunities and paltry farm income these households have been pushed towards poverty. The SCs and STs constitute 39.98 per cent of the State's total population (22.85 per cent STs and 17.13 per cent SCs) (Government of Odisha, 2018). The Scheduled Caste and Scheduled Tribes are considered the weakest sections of the population in terms of common socio-economic and demographic factors such as poverty, illiteracy, lack of progressive facilities and adequate primary health facilities (Thakur et al., 1991; Basu, 1994).

Though Head Count Ratio has declined in the post reform period in the state, it still remains to be higher among Scheduled Caste and Scheduled Tribe households, and further, causal labour and agricultural labour are more poverty trodden compared to self-employed and regular employed (Sahoo, 2019). The state also witnessed wide regional disparities in terms of various indicators of social and economic development (Panda, 2016; Sahoo and Senapati, 2020). The undivided KBK districts are those regions where incidence of poverty is very high (Panda, 2016).

Quite often caste, race, gender, education etc. are the factors explaining labour market participation and employment outcomes (Gordon, 1972; Reich et. al., 1973). The theory popularly known as labour market segmentation theory challenges both neo-classical and human capital theory arguing that workers and jobs are not perfectly matched by competitive market equilibrium. It focused on social stratification of job seekers with respect to class, gender and ethnic groups (Valentine et.al., 1998). Pervasive intergroup inequalities often characterized in Indian labour market that closely matches the economic scheme of caste system (Thorat, 2002). Papola (2012) exploring the sources and implications of various forms of discrimination and social exclusion in the labor market pointed out that there still a large degree of disadvantage faced by certain social groups in employment and wage which are being accounted for both by differences in endowment among different social groups and labour market discrimination. The theory of labour market segmentation is further viewed in the context of dualism consisting of both formal and informal sectors. Formal sector is characterized by better job quality with provisions of social and economic security to workers with better educational background and skill base. On the other hand, informal sector consists of workers commands lower wages with no social and economic security. It is therefore, expected that persons belonging to lower segments of society have higher concentration in informal sector and higher probability of falling into the poverty line.

With this background, the present paper examines the pattern of employment in the study region across different social groups and estimate the head count ratio using expenditure methods. In the context of rural setting in both Kalahandi and Bargarh district, the study seeks to analyse how the patten of employment among households determines the economic outcomes. The households per capita monthly consumption expenditure has been estimated and accordingly approximate proportions of households living below poverty line has been calculated in both regions across different social groups.

Objectives

The paper has three specific objectives. First it examines the pattern of employment across social groups in two districts of Odisha with the help of primary data. Secondly, it examines consumption expenditure of households on both food and non-food items. Thirdly, the study estimates the percentage of population below poverty line across social groups using modified missed recall period method. The paper is planned as follows: after introduction, the first section deals with data and research methodology, the second section deals with employment pattern of households in two selected districts. The third section examines expenditure pattern of households across social groups and the fourth section deals with issue and estimation of poverty. The final section presents concluding remarks.

Methodology

The study is based on primary data collected with the help of structured questionnaire. Two districts viz., Kalahandi and Bargarh have been selected from western part of Odisha. The former is a backward district from KBK region and the later a relatively better off one. Both the districts have been identified based on literacy level and per capita income. Bargarh has a cement factory and a sugar mill. It is the main centre for manufacturing Sambalpuri clothes having good market across the country. Further, the district is better irrigation network. Attabira, one of selected blocks is known as the rice bowl of Odisha because of its contribution to paddy production. Kalahandi is a less developed region, mainly an agriculture-based economy and has a high concentration of SC and ST population.

Two blocks have been chosen from each district: Attabira and Bijepur from Bargarh and Bhawanipatna and Narla from Kalahandi. Drawing upon Census data one block from each district is chosen in such a manner that a higher proportion of household industry workers are covered. Using stratified random sampling method, a total sample of 785 households were selected of which, 389 are from Bargarh and 396 are from Kalahandi. At the village level, strata have been formed based on 'caste or social category' (such as, SC, ST, Other Backward Class or OBC and General) and pro-rata sampling based on population was done.

As shown in Table 1, OBC remains the dominant caste group with Bijepur block having the highest (68.2 %) share. The ST category accounting for 26.2 per cent emerge the next major group. In Kalahandi ST households dominate with about one-third of the total sample. Attabira and Bhawanipatna blocks have higher proportion households belonging to the ST category. Attabira block has higher proportion of SC households (27.2%) compared to other blocks. General category households constitute only 5.1 per cent of the total sample.

Table 1: Distribution of Sample Households by Social Group and Block

Block	SC	ST	OBC	General	All
Attabira	52 (27.2)	55 (28.8)	68 (35.6)	16 (8.4)	191 (100)
Bijepur	39 (19.7)	17 (8.6)	135 (68.2)	7 (3.5)	198 (100)
Bargarh District	91 (23.4)	72 (18.5)	203 (52.2)	23 (5.9)	389 (100)
Bhawanipatna	30 (15.4)	90 (46.2)	72 (36.9)	3 (1.5)	195 (100)
Narla	41 (20.4)	44 (21.9)	102 (50.7)	14 (7.0)	201 (100)
Kalahandi District	71 (17.9)	134 (33.8)	174 (43.9)	17 (4.3)	396 (100)
All Blocks	162 (20.6)	206 (26.2)	377 (48.0)	40 (5.1)	785 (100)

Note: Figures in parentheses are percentage of total

Result Analysis
Employment Pattern in the Districts and in Study Regions

As per the 2011 census, in Bargarh district, cultivators constituted 30.29 per cent and agricultural labour 50.59 of total workers (Table 2). As of the blocks, while Bhatli and Ambabhana have higher proportion of cultivators, Jharbandha, Gaisilet and Paikmal have higher proportion of agricultural labourers. However, Bijepur, Bargarh, Bargarh and Bhatli have larger proportions of other workers in household industry, processing, servicing and other works. In Bijepur and Barpali the dominant household industry has been the weaving of Samablpuri sarees.

Table 2: Block-wise Distribution of Workers in Bargarh District

(Percentage)

Name of CD Block	Cultivators	Agricultural labourers	Household industry workers	Other workers
Jharbandha	31.99	59.62	1.51	6.88
Paikamal	29.80	58.02	1.53	10.65
Padmapur	25.83	54.62	7.19	12.36
Gaisilet	29.51	59.17	2.62	8.70
Bijepur	27.93	50.03	11.18	10.87
Sohela	32.32	48.45	7.24	12.00
Bhatli	38.31	38.32	7.51	15.86
Ambabhona	40.32	41.18	4.77	13.73
Attabira	23.60	52.79	6.17	17.44
Bargarh	30.81	41.48	6.48	21.23
Barapali	32.53	46.28	9.58	11.61
Bheden	28.76	54.52	4.78	11.94
Total	30.29	50.59	6.03	13.08

Source: Census of India, 2011

Kalahandi is mainly rural and has a high concentration ST and SC communities. Despite rich deposits of minerals including bauxite, graphite, manganese and iron ore farming remains the main source of employment and income for majority of the people. As may be seen from Table 3, 81.5 per cent of the working population is engaged in agriculture and allied activities. Of these, 20.2 per cent workers have been reported as cultivators and 61.1 per cent as causal labourers. About 16.3 per cent workers are engaged in other services and the rest 2.4 per cent in household industries. While Kalampur block has the highest number of agricultural labour in Bhawanipatna, Narla and Kesinga have higher proportion of workers in household industry and other activities. Overall, it appears that both Bagarh and Kalahandi districts have higher percentage of population depending on agriculture. With the decline in the size of landholdings and a rise in the cost of cultivation, agriculture has no longer been remunerative. This has led small farmers and landless labour to look for alternative source of employment. In many cases, it has also led to migration to urban areas and cities.

Table 3: Block-wise Distribution of Workers in Kalahandi District

(Percentage)

Name of CD Block	Cultivators	Agricultural labourers	Household industry workers	Other workers
Golamunda	19.5	62.2	3.2	15.1
Dharamgarh	22.3	59.9	2.1	15.7
Junagarh	19.7	64.8	2.1	13.3
Kokasara	20.3	62.7	2.7	14.2
Jayapatna	19.7	67.7	2.4	10.3
Kalampur	15.6	74.0	1.4	9.1
Thuamul Rampur	19.2	64.9	2.6	13.3
Lanjigarh	19.6	60.8	1.3	18.3
Bhawanipatna	22.1	51.1	2.5	24.3
Kesinga	19.3	49.5	2.4	28.9
Karlamunda	21.9	62.3	1.6	14.2
Madanpur Rampur	20.0	65.9	2.5	11.5
Narala	21.1	58.1	3.1	17.7
Total	20.2	61.1	2.4	16.3

Source: Census of India, 2011

Primary data on employment pattern of households is based on 389 samples from Bargarh and 396 from Kalahandi. As shown in Table 4, in Bargarh a little over one-third of households have cultivation as their main economic activities. While in Attabira with 45.0 per cent households having cultivation as the main activity, in Bijepur it is slightly above one-fourth of households. A high proportion of OBC and General households reported

cultivation as their main occupation which indicates their better landholding status. A large percentage of SC and ST households are working as causal labour in both regions. More than half of these households in the district are working as wage labour. Access to land by SC households was found less compared to other social groups. In general, small and marginal farmers irrespective of social groups have to look for alternative occupations as the small holdings do not allow them adequate earnings.

Table 4: Percentage Distribution of Households by Occupations (Main Economic Activities) Bargarh

Block	Type of HH	Culti vator	Casual Worker	Self employe d	Tempor ary job	Regul ar job	Oth ers
Attabira	All	45.0	31.4	13.1	4.7	4.2	1.6
	SC	36.5	40.4	17.3	3.8	1.9	0.0
	ST	36.4	52.7	5.5	3.6	0.0	1.8
	OBC	58.8	14.7	13.2	5.9	5.9	1.5
	Gen	43.8	0.0	25.0	6.3	18.8	6.3
Bijepur	All	25.8	26.8	40.4	3.5	2.0	1.5
	SC	5.3	66.7	23.1	2.6	2.6	0.0
	ST	35.3	58.8	0.0	0.0	5.9	0.0
	OBC	30.4	12.6	52.6	2.2	1.5	0.7
	Gen	28.6	0.0	0.0	42.9	0.0	28.6
Both Blocks	All	35.2	29.0	27.0	4.1	3.1	1.5
	SC	23.1	51.6	19.8	3.3	2.2	0.0
	ST	36.1	54.2	4.2	2.8	1.4	1.4
	OBC	39.9	13.3	39.4	3.4	3.0	1.0
	Gen eral	39.1	0.0	17.4	17.4	13.0	13.0

Source: Field Survey

Note: Causal workers include both farm and non-farm, Self-employed includes only non-farm sector. HH: Household, Gen: General

In Bargarh district, 27 per cent households reported self-employment as their main occupation. Bijepur alone had 40.4 per cent households, majority of whom belonged to the weaving community. The OBC households had a larger share with self-employment that was often associated with their caste or family occupation. Some of the traditional caste occupations reflect the needs of village society and belief system, where the pursuer can only perform (Meher 2021). Further while 3.1 per cent households were employed in regular jobs with social and economic security 4.1 per cent had

formal jobs but of a temporary nature. General households have noticeable share in formal jobs. For about 1.5 per cent of households the main source of livelihood has been the 'Other' category which includes land rent, salaried pension, old age pension, private tuition, wood collections, bullock labour, etc.

As shown in Table 5, in Kalahandi 18.7 per cent households had cultivation as prime source of occupation; while among SC households this proportion was only 2.8 per cent, it was nil for Bhawanipatna. Nearly three-fourths of households among SC and ST had casual work as their prime source of livelihood. It is to be noted that since agriculture is not developed commercially in the region, most households earned their livelihood from non-farm casual employment mostly in the construction sector. Further, it becomes difficult for them to find jobs throughout the year, and as labour supply is high they command a lower wage.

Table 5: Distribution of Households by Main Occupation in Kalahandi

(Percentage)

Blocks	Type of House holds	culti vator	Casual Workers	self employ ed	Tempor ary job	Regul ar job	Oth ers
Bhawa nipatna	All	21.0	50.8	8.7	14.4	2.6	2.6
	SC	0.0	77.4	12.9	6.5	3.2	0.0
	ST	24.4	67.8	1.1	5.6	0.0	1.1
	OBC	26.8	19.7	16.9	28.2	2.8	5.6
	Gen	0.0	0.0	0.0	33.3	66.7	0.0
Narla	All	16.4	59.2	12.9	6.0	2.5	3.0
	SC	4.9	73.2	12.2	7.3	2.4	0.0
	ST	11.4	75.0	6.8	4.5	0.0	2.3
	OBC	23.5	53.9	11.8	4.9	1.0	4.9
	Gen	14.3	7.1	42.9	14.3	21.4	0.0
Both Blocks	All	18.7	55.1	10.9	10.1	2.5	2.8
	SC	2.8	75.0	12.5	6.9	2.8	0.0
	ST	20.1	70.1	3.0	5.2	0.0	1.5
	OBC	24.9	39.9	13.9	14.5	1.7	5.2
	Gen	11.8	5.9	35.3	17.6	29.4	0.0

Source: Same as Table 4

Approximately 11 per cent households reported non-farm self-employment in the district, ST households accounting for hardly 3 per cent. Maximum number of households from the General category (35.3 per cent) have their own-account business. Around 13 per cent households in the district have

salaried jobs led by Bhawanipatna block, the district headquarters. Salaried jobs were most prevalent in OBC (28.2 per cent) and General households (33.3 per cent) partly due to better educational status and information network.

Monthly Consumption Expenditure Per Capita and Estimation of Poverty

This section examines the monthly per capita consumption expenditures in order to assess the economic position of households and arrive at an estimate of poverty head count ratio in the study regions. Economic theory suggests that current consumption measures the material well-being of the family more directly than current income. It may happen that for the poorer households, current consumption expenditure may exceed current income due to income deficit or the need of an excess expenditure borne out of borrowings. Hence, an approximate measure of poverty has been arrived at by taking data on monthly consumption expenditure per capita per month in the present study.

The estimate of poverty is arrived in India usually through data on monthly consumption expenditure. Time and again, the Planning Commission, Government of India had set up several commissions to estimate poverty using an improved methodology. The reports of the Tendulkar Committee (Planning Commission, 2009) and Rangarajan Committee (Planning Commission, 2014), are among the leading estimates in India in this direction. These estimates have used data on monthly consumption expenditure provided by the National Sample Survey Organisation (NSSO). Nevertheless, there have been debates over the methodology of collection of data on consumption expenditure. The Tendulkar Committee had recommended a Mixed Recall Period (MRP) for collecting different items of consumption in which for high frequency items the reference period was 30 days and for low frequency items such as education and health it was 365 days. Prior to this however, on a large scale Uniform Recall Period (URP) were in use in which for all consumption items the recall period was similar. The Rangarajan Committee had suggested a Modified Mixed Recall Period (MMRP). Under this method, the reference period for low frequency items like clothing, footwear, education, institutional medical care, and durable goods was 365 days. The recall period was 7 days for high frequency items such as edible oil, egg, fish and meat, vegetables, fruits, spices, beverages, refreshments, processed food, pan, tobacco and intoxicants. The recall period was 30 days for the remaining food items, fuel and light, rent and taxes, and non-institutional medical care.

The present study follows the MMRP. The Rangarajan Committee had also examined several non-income parameters to effectively combine with consumption expenditure and evolve the basis of estimating poverty in both rural and urban areas. These non-income parameters stem from the

'Capabilities approach' to the concept of poverty. A few such key capabilities are; (i) to be (at least minimally) educated; (ii) to escape avoidable diseases; and (iii) to be adequately sheltered. This is important because lack of education or adult illiteracy reflects past provisioning of public services and private decisions to avail of these services and to utilize a part of private purchasing power for the same and for essential complementary goods and services. In respect of the capability to escape avoidable diseases, morbidity and mortality may be expected to be more closely associated with availability of and access to safe drinking water, sewage and sanitation facilities rather than the money value of the privately purchased consumption basket. The present study however stuck to the consumption expenditure approach to arrive at the Head Count Ratio in the study regions.

Per Capita Monthly Consumption Expenditure

The per capita monthly consumption expenditure of the sample households has been presented in Table 6. Bargarh district (Rs. 1512.50) has higher per capita consumption expenditure (Rs. 1273.10) than that of Kalahandi district. It may be noted that the per capita consumption expenditure of General households is almost twice that of the SC households. On an average, an SC household spent Rs. 1247 per month and the ST household spent Rs. 1343.50. However, OBC households spent Rs. 1595.8 per capita per month and General households spent Rs. 2357 per month.

Table 6: Per Capita Monthly Consumption Expenditure in Bargarh District

(Rs.)

Social category		Attabira		Bijepur		Both blocks	
		Per capita per month expenditure	Percentage	Per capita per month expenditure	Percentage	Per capita per month expenditure	Percentage
SC	Food	736.5	56.3	558	49.0	660.4	53.0
	N-food	591.5	43.7	580.5	51.0	586.8	47.0
	All	1328	100	1138.5	100	1247.2	100
ST	Food	765.3	54.7	633.3	54.4	734.1	54.6
	N-food	630.1	45.3	542.7	45.6	609.4	45.4
	All	1395.4	100	1176	100	1343.5	100
OBC	Food	834.8	46.7	750.1	51.0	778.3	48.8
	N-food	954.7	53.3	748.4	49.0	817.5	51.2
	All	1789.5	100	1498.5	100	1595.8	100
General	Food	915.4	37.9	766	36.7	869.9	36.9
	N-food	1514.7	62.1	1424.4	63.3	1487.2	63.1
	All	2430.1	100	2190.4	100	2357.1	100
All	Food	794.6	49.7	702.9	50.6	747.9	49.4
	N-food	809.4	50.3	721.5	49.4	764.6	50.6
	All	1604	100	1424.4	100	1512.5	100

Source: Same as Table 4
Note: N-food: Non-Food

In Kalahandi, as shown in Table 7, Narla block recorded a higher per capita monthly expenditure than that in Bhawanipatna block. Here also, the expenditure level of General households was higher than that of SC, ST and OBC households, even as the magnitude of difference across social group is not as high as in case of Bargarh district. While an SC household spent Rs. 1225.30, the ST household spent Rs. 1118.60 per capital per month. For General and OBC households the same stood at Rs. 1353.50 and Rs. 1867.20. In both regions, however, spending on food and non-food items has been different. This has been analysed in the following section.

Table 7 Per Capita Monthly Consumption Expenditure in Kalahandi District

(Rs.)

Social Category		Bhawanipatna	%	Narla	%	Both Blocks	%
SC	Food	610.4	54.3	775.9	59.4	705.9	57.6
	Non-food	501.6	45.7	532.5	40.6	519.4	42.4
	All	1112	100	1308	100	1225.3	100
ST	Food	632.7	58.8	720.1	60.4	661.4	59.1
	Non-food	449.2	41.2	473.5	39.6	457.2	40.9
	All	1081.9	100	1194	100	1118.6	100
OBC	Food	708.3	51.3	775.3	58.5	747.6	55.2
	Non-food	675.1	48.7	557.1	41.5	605.9	44.8
	All	1383.4	100	1332	100	1353.5	100
General	Food	1015.7	46.7	793.6	44.7	832.8	44.6
	Non-food	1174.7	53.3	1004.3	55.3	1034.4	55.4
	All	2190.4	100.0	1797.9	100.0	1867.2	100
All	Food	663.1	54.7	764.6	57.9	714.6	56.1
	Non-food	551.8	45.3	564.9	42.1	558.5	43.9
	All	1214.9	100.	1329	100	1273.1	100

Source: Same as Table 4

Distribution of Expenditure on Food and Non-food Items

On the basis of Engel's Law one would expect that General and OBC households who are better placed in terms of employment opportunities and are expected to have better income, would spend more on non-food items than SC and ST households. In other words, it is natural to expect that income elasticity demand for non-food grain items for richer households tend to be higher than the poorer class. Hence, while in poorer households the proportion of expenditure on food items would be relatively high richer households tend to spend more on non-food items. Distribution of household expenditure on food and non-food items reflects the social and economic position of households.

Household expenditure data were collected for different items of food as grains, cereals, pulses, vegetables, fish, meat, intoxicants and other food items. Non-food items included clothing, footwear, housing, fuel and light, health, cosmetics, education, durable goods and other items. The share of expenditure on food items (49.4 %) and non-food items (50.6 %) is almost

similar in Bargarh. This distribution is almost the same in both blocks, though the share of non-food items in Attabira block is slightly higher. Across different blocks, it may be observed that SC and ST households spent more on food items than on non-food items compared to OBC and General households. General households, who enjoy better economic position, spent as high as 63.1 per cent of total income on non-food items. This is true for both blocks. Kalahandi, being a less developed region, presents a different scenario as households here spent more on food items (56.1 % on food grains) compared to non-food items. Among SC and ST households around 60 per cent expenditure accounted for food items. General households, however, spent more on non-food items. There is no major difference in the expenditure pattern in both blocks.

Analysis of Monthly Consumption Expenditure: Poverty Estimate

Households are classified by expenditure ranges; it starts from 'up to Rs. 1000' to 'above Rs. 2500' per capita per month. Earlier, mention had been made of the estimates of poverty which is mostly based on the monthly expenditure on per capita terms. The latest Rangarajan Committee outlines the monthly expenditure limit at the all India level to be Rs. 972 in rural areas and Rs. 1407 in urban areas. In Odisha, the same was Rs. 876.42 in rural areas and Rs. 1205. 37 in urban areas. In the present study, we have taken a threshold of Rs. 1000 per capita per month expenditure, which amounts to approximately Rs. 33.33 per capita per day to determine the estimates of poverty. A higher side of consumption expenditure of Rs. 1000 per capita per month compared to estimates provided by expert group of Rs. 873.42 in 2014 is expected to capture price rise under different consumption expenditure. Therefore, poverty estimates under the present investigation will provide an approximate figure.

Tables 8 and 9 provide the proportions of households under the defined expenditure ranges across social groups. The first row of both tables provides the estimates of poverty in respective blocks and by different social groups. Such proportion in Bargarh district stood at 26.7 per cent; hence, the Head Count Ratio of poverty in Bargarh district as a whole is 26.7 per cent (Table 8). Not surprisingly, the head count ratio for SC and ST is higher than that for OBC and General households. Nearly 38.5 per cent households among SCs are below poverty line and for ST households the same is 34.7 per cent. Poverty ratio in Attabira block (24.1 %) is lower than that in Bijepur block (29.3 %). In both blocks, the poverty ratio is higher among the SC and ST households compared to General and OBC households. Compared to Attabira, in Bijepur the SC and ST households were worse off where the poverty ratios stood at 43.6 per cent and 47.1 per cent, respectively. Around 85 per cent SC households and 95 per cent ST households were spending less than Rs. 1500 per capita per month. While 43 per cent of General households were spending more that Rs. 2500 per

month, the proportions were only 1.1 and 1.4 per cent, respectively, for SC and ST households.

Table 8: Distribution of Households by Consumption Expenditure and Social Category, Bargarh District

(Percentages)

Attabira					
Expenditure Range (in Rs. Per Month)	SC	ST	OBC	General	All Households
0-1000	34.6	30.9	14.7	6.3	24.1
1001-1500	30.8	36.4	29.4	18.8	30.9
1501-2000	26.9	20.0	22.1	25.0	23.0
2001-2500	5.8	10.9	11.8	6.3	9.4
Above 2500	1.9	1.8	22.1	43.8	12.6
All	100	100	100	100.0	100
Bijepur					
0-1000	43.6	47.1	24.4	0.0	29.3
1001-1500	41.0	47.1	28.9	28.6	32.8
1501-2000	15.4	0.0	31.1	14.3	24.7
2001-2500	0.0	5.9	12.6	14.3	9.6
Above 2500	0.0	0.0	3.0	42.9	3.5
All	100	100	100	100	100
Both Blocks					
0-1000	38.5	34.7	21.2	4.3	26.7
1001-1500	35.2	38.9	29.1	21.7	31.9
1501-2000	22.0	15.3	28.1	21.7	23.9
2001-2500	3.3	9.7	12.3	8.7	9.5
Above 2500	1.1	1.4	9.4	43.5	8.0
All	100	100	100	100	100

Source: Estimated from Field Survey Data.

From Table 9, it may be seen that taking the first two expenditure ranges, ST households accounted for a high of 85.8 per cent and SC households 73.3 per cent. Similarly, in terms of the above Rs. 2500 expenditure category ST households were non-existent while SC households were just 1.4 per cent. Nearly one-third of OBC households were found to spend up to 1000 rupees per capita per month, indicating extensive prevalence of poverty amongst OBC households. It is notable that 17.6 per cent of General households were also found to be under the poverty line. The proportion of OBC households below poverty line in Narla block was much higher than that in Bhawanipatna block where many of these households were working in shops and small trading units. Most of the SC and ST households could not avail this opportunity in Bhawanipatna due to

illiteracy and poor access to information. High incidence poverty in SC and ST households at 56.7 per cent and 53.3 per cent, respectively, is discernible from the survey data. Poverty seems pervasive in Kalahandi district.

Table 9: Distribution of Households by Consumption Expenditure and Social Category, Kalahandi District

(Percentages)

Bhawanipatna	SC	ST	OBC	General	All Households
0-1000	53.3	56.7	26.4	0.0	44.1
1001-1500	33.3	28.9	34.7	66.7	32.3
1501-2000	13.3	10.0	27.8	0.0	16.9
2001-2500	0.0	4.4	11.1	0.0	6.2
Above 2500	0.0	0.0	0.0	33.3	0.5
All	100.0	100.0	100.0	100.0	100.0
Narla					
0-1000	39.0	40.9	35.3	21.4	36.3
1001-1500	24.4	45.5	32.4	21.4	32.8
1501-2000	31.7	11.4	21.6	21.4	21.4
2001-2500	2.4	2.3	8.8	21.4	7.0
Above 2500	2.4	0.0	2.0	14.3	2.5
All	100.0	100.0	100.0	100.0	100.0
Both Blocks					
0-1000	45.1	51.5	31.6	17.6	40.2
1001-1500	28.2	34.3	33.3	29.4	32.6
1501-2000	23.9	10.4	24.1	17.6	19.2
2001-2500	1.4	3.7	9.8	17.6	6.6
Above 2500	1.4	0.0	1.1	17.6	1.5
All	100.0	100.0	100.0	100.0	100.0

Source: Estimated from Field Survey Data.

Overall, it appears from the above analysis that poverty and economic vulnerability for SC and ST households were higher than those for the OBC and General households in both districts. Problems of unemployment specially underemployment persist in these regions.

Conclusion

The paper attempts to examine the pattern of employment and estimate the head count ratio using expenditure methods in two districts of western Odisha viz., Bargarh and Kalahandi. Based on primary data collected from 785 households in both districts, per capita monthly consumption expenditure has been estimated and accordingly approximate proportions of households living below poverty line has been calculated in both districts

across different social groups. It has been found that large majority of employment generated in both districts are either in cultivation or causal labour from both farm and non-farm sector. Across social groups majority of households belonging to SC and ST were earning their livelihood from causal labour. Since both districts are primarily agrarian in nature and lack non-farm employment opportunities, daily wage workers do not find adequate employment. Self-employment in rural areas has been less remunerative. Most SC and ST households are steeped in poverty and lack adequate physical and human capital to pursue self-employment options. In Kalahandi, the incidence of poverty is high even in OBC households. As these data had been collected in 2018-19, it is expected that in the subsequent period that witnessed the devastating effect of the pandemic, it is expected that economic vulnerabilities of socially and economically deprived groups must have risen further. Moreover, MGNREGA in the both these districts have been discontinued since last few years. In view of this, the need for creating opportunities in imparting education and varied skills cannot be overemphasized. It is also essential to invest in both rural infrastructure and providing for farm-related support services.

References

Basu, S.K. (1994). The state of the art: Tribal health in India, in Salil Basu (ed), *Tribal Health in India*. Manak Publication Pvt. Ltd., New Delhi.

Gordon, D. (1972). *Theories of Poverty and Underemployment*. Lexington, Mass.

Government of Odisha (2017). *Depth and Severity of Poverty in Rural Odisha: A District Level Estimation*. Directorate of Economics and Statistics, Bhubaneswar.

Government of Odisha (2018). *Odisha Economic Survey 2017-18*. Planning and Convergence Department, Directorate of Economics and Statistics.

Government of India (2021). *National Multinational Poverty Index, Baseline Report*. Niti Aayog.

Government of India (2011): Census Report, Office of the Registrar General & Census Commissioner, Ministry of Home Affairs.

Meher, Surendra (2021). Occupational segmentation and earning differences across social class: An investigation from rural Odisha. *Indian Journal of Labour Economics*, *64*(3), 749-767.

Mehrotra, Santosh, Jajati Parida, Sharmistha Sinha, & Ankita Gandhi (2014). Explaining employment trends in the Indian economy: 1993-94 to 2011-12. *Economic and Political Weekly*, *49*(32), 49-57.

Nanda, Prabhakar, Mukesh K. Sinha & Ashwani Kumar (2011). Poverty and agricultural development scenario in India: A regional analysis. *MPRA Paper No. 55626*. https://mpra.ub.uni-muenchen.de/55626/

Papola, T.S. (2013). Role of labour regulation and reforms in India: Country case study on labour market segmentation. *Employment Working Paper No. 147*, ILO, Geneva.

Papola, T. S. (2012). Social exclusion and discrimination in the labour market. *Working Paper No. 2012/04*, Institute for Studies in Industrial Development, New Delhi.

Panda, Pradeep (2016). Regional disparity in development of Odisha economy: Assessment of
schemes, issues and challenges. *Orissa Economic Journal*, *48*(1 & 2), 124-132.

Planning Commission (2009). *Report of the Expert Group to Review the Methodology for Estimation of Poverty*. New Delhi: Government of India.

Planning Commission (2014). *Report of the Expert Group to Review the Methodology for Estimation of Poverty*. New Delhi: Government of India.

Reddy, A. Amarender (2015). Growth, structural change and wage rates in rural India. *Economic and Political Weekly*, *50*(2), 56-65.

Reddy, A. Amarender (2012). Sources of agricultural productivity growth in Orissa: A district level analysis. *The Journal of Income and Wealth*, *34*(2), 89-105.

Reich Michael, David M. Gordon & Richard C. Edwards (1973). A theory of labour market segmentation. *American Economic Review, 63*(2), 359-365.

Sahoo, Priyabrata & Asis Kumar Senapati (2020). Growth and regional disparities in Odisha: An analysis in the post-reform period. *Arthaniti: Journal of Economic Theory and Practice.* https://doi.org/10.1177/0976747920961934

Sahoo, Priyabrata (2019). Poverty in Odisha: An analysis of inclusiveness. *Indian Journal of Economics*, *99*(392), 99–119.

Thakur, D.S., D. C. Thakur, & A. S. Saini (1991). Socio-economic impact of tribal development programmes in Himachal Pradesh. *Journal of Rural Development*, *10*, 823-830.

Thorat, Sukhadeo, & R. S. Deshpande (2001). Caste system and economic inequality: Economic theory and evidence. In Ghanshyam Shah (Ed.) *Dalit Identity and Politics: Cultural Subordination and Dalit Challenge, Vol.2* (pp. 44-73). Sage Publications, New Delhi.

Thorat, S. (2002). Oppression and denial: Dalit discrimination in the 1990s. *Economic and Political Weekly*, *37*(6), 572-578.

Valentine, G., T. Skelton, & D. Chambers (1998). Cool places: An introduction to youth and youth cultures. In T. Skelton & G. Valentine (Eds.), *Cool Places: Geographies of Youth Cultures* (pp. 1-32). London, Routledge.

Changing Dynamics of Odisha Agriculture: Implications for Doubling of farmers' Income by 2022-23

Amit Kumar Basantaray

Abstract

The analysis of data from the situation assessment surveys of the NSS 70th and 77th rounds, *inter alia,* brings forth the following important changes in the agrarian economy of Odisha. i. a significant increase in the number of agricultural households implying growing importance of crop sector; ii. increase in the incidence of landlessness; iii. decrease in the proportion of land owned by marginal and small farmers and an increase in the share of area owned by large farmers making distribution of land more skewed; iv. increase in the magnitude of tenancy in terms of the amount of land transacted and decrease in the proportion of households participating in the lease market both as lessees and lessors; v. emergence of income from wages followed by cultivation as the major source of income of agricultural households; vi. a significant increase in incidence of indebtedness among marginal, small and medium households; and vii. annual income of agricultural households has to increase at a rate of 18.50 per cent per annum between 2018-19 and 2022-23 if their income is to double by 2022-23 which does not seem possible.

Keywords: Odisha; Agricultural Households; Income; Indebtedness

_____

Amit Kumar Basantaray, Assistant Professor, Department of Economics, Central University of Himachal Pradesh, Dharamshala, Himachal Pradesh. Email: amiteco@hpcu.ac.in

Introduction

Odisha continues to be an agrarian state with the sector contributing around 21 per cent of the state domestic product and employing 55 per cent of the workforce which is much above the national average of 44 per cent. It is one of the poorest states in India as 33 per cent of its population is poor (NSSO; 2011-12). Odisha registered an annual growth rate of 8 per cent during 2003 to 2013 which was higher than the growth rate of the national economy and also of major states (Sahu an Panda, 2018). In comparison, the annual average growth rate of agriculture and allied sector in the state was 4.07 per cent at 2011-12 prices over a period of nine years during 2012-22 (*Odisha Economic Survey 2021-22*). The state also registered a decrease in the area and production of rice, the dominant crop area-wise, during 1994-2004 along with a significant decline in the yield, gross cropped area (GCA), net sown area (NSA) and increased 'chemicalisation', particularly in the mining districts (Mishra, 2010). The study by Shah & Pattnaik (2010) also corroborated the fall in NSA and reported that around 6 lakh hectares of land moved out of cultivation during 1995-96 and 2003-04. The low growth rate of agriculture along with increased instability, particularly in the aftermath of liberalisation, has been attributed to poor irrigation intensity, decline in NSA as well as gross irrigated area and meagre use of fertilizers and other inputs (Paltasingh and Goyari, 2013). Swain (2014) found higher extent of instability in agricultural production and productivity in western Odisha, in general and in Bolangir district in particular on account of high level of rainfall variability and low irrigation coverage. In brief, the farm sector in Odisha has recorded very low growth rate in recent years and is marred by high instability across regions. Further, the average monthly income of agricultural households in Odisha was Rs. 4976 in 2012-13, which was lower than that of the average annual income of Rs. 6426 of agricultural households at the all-India level. Using the National Sample Survey Office (NSSO) data, Basantaray and Nancharaiah (2017) found that income of agricultural households was higher than the state average only in three districts, namely, Angul, Jharsuguda and Bolangir. Mishra (2009) attributed low reduction in poverty between 1993-94 and 2004-05 in the state to poor performance of agriculture coupled with non-availability of non-farm employment opportunities. Therefore, raising agricultural performance and increasing farm income remain major challnges for policy makers.

The Government of India (GoI) has set a target to double farmers' income by 2022-23 over 2014-15. Subsequently, several scholars have suggested different strategies to accomplish the target (Chand, 2017; Singh, 2020). It is pertinent to mention here that the average monthly total income of agricultural households in India in nominal terms increased from Rs. 2115 in 2003 to Rs. 6426 in 2013; and among all states Odisha was the only one where the nominal farm income doubled. However, unlike nominal income, real farm income, which has

undergone increase, did not double during the period implying that focusing only on income from cultivation will not be sufficient to double farm income in real terms (Chandrasekhar and Mehrotra, 2016). Chand (2017), using the NSSO data on consumption expenditure survey (2011-12), reported that more than one-fifth of the rural households which had self-employment in agriculture as their principal occupation were below poverty line. Further, though the incidence of poverty among such households varied widely across states, it was found to be quite high in all eastern states except West Bengal. And it has been suggested that while farm income can be improved through improvement in productivity, resource use efficiency, increase in cropping intensity, and diversification towards high value crops; shifting cultivators from farm to non-farm occupations, and improvement in terms of trade for farmers or real prices received by farmers are other important pathways of augmenting farmer's income. Similarly, yet another study stated that in the medium term, the strategies that could double farmer's income are improvements in the resource use efficiency, diversifying to high-value crops, improved price realization by farmers, and boosting the livestock sector productivity (NABARD & IFMR, 2007).

In recent times, the GoI has taken numerous measures like increasing minimum support price of different crops and has launched a number of schemes such as Pradhan Mantri Kisan Samman Nidhi Yojana, Pradhan Mantri Fasal Bima Yojana, Pradhan Mantri Krishi Sinchai Yojana, e-Nam initiative, National Mission for Sustainable Agriculture, Livestock and Insurance Scheme to boost farmers' income. In a similar vein, the Government of Odisha (GoO) has also introduced schemes like Kalia and Balaram to help farmers, especially landless farmers, achieve higher income and timely credit. These schemes and programmes along with other factors such as changes in input cost, higher value of output due to increased productivity and higher prices of produce will likely result in higher farm income in Odisha. While it may be useful to examine the effect of each of the above-mentioned schemes and programmes on farmers' income by collecting appropriate data, the present study aims at identifying recent changes in the agrarian sector which have implications for farmers' income and its doubling by 2022-23. In particular, the study, seeks to examine changes in owned and operated land, incidence of tenancy, changes in GCA, value of production and yield, cost of production, and indebtedness among agricultural households.

The paper has been structured in five sections. Section I discusses the sources and comparability of data from the two NSSO rounds. Section II analyses salient features of the agrarian structure. Section III discusses changes in GCA, yield, cost and receipts from cultivation and animal farming. Changes in nominal and real income, indebtedness among agricultural households, and the feasibility of doubling of farmers' income are dealt in Section IV. Conclusions of the study are presented at the end.

Section I: Sources of Data and Its Comparability

The study has used data available in three reports of the NSSO. i. Two reports based on the 70th Round (January 2013 to December 2013) on "Situation Assessment Survey of Agricultural Households (SAS)" and "Land and Livestock Holdings Survey (LHS)". ii. The report based on the 77th Round (January 2019 to December 2019) on "Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India" (pertaining to the agricultural year July 2018 to June 2019). In these surveys, inter alia, data on income, productive assets and indebtedness of agricultural households and farming practices of agricultural households, and land and livestock ownership by these households has been collected. Agricultural households in both the rounds are broadly comparable. In the 77th Round, an agricultural household is defined as a household receiving value of produce more than Rs. 4000 from agricultural activities such as cultivation of field crops, horticultural crops, fodder crops, plantation, animal husbandry, poultry, fishery, piggery, bee-keeping, vermiculture, sericulture etc.; and having at least one member self-employed in agriculture either in the principal status or in subsidiary status during the last 365 days. Similarly, in the 70th Round, households receiving value of produce more than Rs. 3000 and all other conditions remaining same, were considered as agricultural households.

In this study, categorization of households has been done on the basis of both ownership holdings[1] and operational holdings[2]. Ownership holding of an agricultural household is simply the land owned by it. However, all the owned land may not be available for cultivation. For example, homestead land would come under ownership holdings but not operational holdings, which takes into account land leased-in and leased-out. Further, a farmer may fall in the large farmer category in terms of ownership holdings but he may fall in the small or some other category in terms of operational holdings. Therefore, it is desirable to see distribution of households in terms of both ownership and operational holdings. We have classified households in different categories: landless households are those having less than 0.002 hectares of owned land, marginal households have less than 1 hectare of owned

---

[1] A plot of land was considered owned by the household if permanent heritable possession, with or without the right to transfer the title, was vested in a member or members of the household. Land held in owner-like possession under long term lease or assignment was also considered as land owned.

[2] Within a household, different household members might possess different lands. In the NSSO survey, information was collected for household operational holding considering all the lands operated by all the household members together as a single operating unit. Household operational holding comprises all land that was used wholly or partly used for agricultural production and was operated (directed/managed) by one household member alone or with the assistance of others, without regard to title, size or location. The land might be operated by members belonging to a single household or by members belonging to more than one household operating jointly.

and/or operated land, small households have more than 1 hectare and less than 2 hectares of owned and/or operated land, medium households have owned and/or operated land between 2 hectares and 4 hectares, and large households are those having more than 4 hectares of owned and/or operated land. Real income has been calculated by using consumer price index of agricultural labourers (CPI$_{AL}$) collected from the Commission for Agricultural Costs and Prices (CACP) website. Real income at constant prices for 2012-13 and 2018-19 have been calculated by using July 2012-13 CPI$_{AL}$ which was Rs. 740 and June 2018-19 CPI$_{AL}$ which was Rs. 950, respectively.

Section II: Changing Agrarian Structure of Rural Odisha

Table 1 shows that estimated number of rural households in Odisha increased to 8.15 million in 2018-19 from 7.81 million in 2012-13 while the percentage of agricultural households to total rural households during the period increased marginally to 59.02 per cent from 57.49 per cent. However, in per cent terms estimated number of agricultural households increased by 7.13 per cent. The number of non-agricultural households remained virtually stagnant between the two time periods. These changes in agricultural and non-agricultural households could primarily be explained in terms of increasing demographic pressure coupled with lack of employment opportunities in the non-farm sector.

Table 1: Changes in Estimated Number of Households in Rural Odisha, 2012-13 and 2018-19

Particulars	2012-13	2018-19
Estimated number of agricultural households (million)	4.49	4.81 (7.13)
Estimated number of non-agricultural households (million)	3.32	3.34 (0.60)
Estimated number of rural households (million)	7.81	8.15 (4.35)
Agricultural households to total rural households (%)	57.49	59.02

Source: (i) Report on Household Ownership and Operational Holdings in India: 70th Round, 2013, NSS Report No. 571; (ii) Report on Key Indicators of Situation of Agricultural Households in India: 70th Round, 2013; (iii) Report on Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India: 77th Round, 2019, NSS Report No. 587.

Note: Figures in parentheses are percentage changes over the previous year figures.

As shown in Table 2, in 2018-19, there has been a significant increase in the households engaged in crop production both in absolute and percentage terms. Further, marginal increase in the number and percentage of agricultural households in livestock farming is recorded. However, a significant decline in 2018-19, when compared to 2012-13, is observed insofar as agricultural households engaged in other

agricultural activities, non-agricultural activities, wage/salaried employment, and others are concerned. Out of these, an important pointer is the decline in the engagement in non-agricultural and wage/salaried employment activities. Hence, the role of the crop sector in engaging agricultural households in Odisha has increased in 2018-19 over 2012-13. These changes in the number of households engaged in different activities once again bring out the lack of alternative non-farm employment opportunities available to the agricultural households.

Table 2: Estimated Number of Agricultural Households Engaged in Different Activities in Odisha, 2012-13 and 2018-19

Activities	Households (million)	
	2012-13	2018-19
Crop production	2.71 (60.34)	3.54 (73.54)
Livestock farming	0.04 (0.98)	0.06 (1.29)
Other agricultural activities	0.05 (1.18)	0.00 (0.04)
Non-agricultural activities	0.33 (7.30)	0.16 (3.39)
Wage/salaried employment	1.16 (25.90)	0.98 (20.44)
Others	0.19 (4.30)	0.06 (1.30)
All Households	4.49 (100.00)	4.81 (100.00)

Source: As in Table 1
Notes: Figures in parentheses are column percentages.

Each household was classified on the basis of the sources of the household's major income during the 365 days preceding the date of survey. NSSO, for this purpose, considered only the household's income from economic activities and servants and paying guests were not taken into account. So, the above household classification is done on the basis of their major income.

Going by the landholding size, there has been an increase in landless agricultural households from 6.2 per cent in 2012-13 to 8.4 per cent in 2018-19 (Table 3). Marginal agricultural households still account for 77.1 per cent in 2018-19. Further, the percentage of area owned by them has declined from 56.55 per cent to 41.76 per cent. While the percentage of small agricultural households has increased from 6.4 per cent to 11 per cent, their share in owned area has declined from 24.47 per cent to 19.81 per cent. If we combine the marginal and small farmers, in 2012-13 their share in total households and in area owned stood at 91.3 per cent and 81.02 per cent, respectively; but in 2018-19, the respective shares were at 88.2 per cent and 61.57 per cent. This clearly shows that marginal and small agricultural households are still a significant section of total agricultural households in Odisha but their share in total area owned has come down significantly. There has been a marginal increase in the percentage of medium and large agricultural households in 2018-19 as compared to 2012-13. However, a significant decline and a notable increase have been experienced in the share of area owned by medium households and large households, respectively, in 2018-19 in

comparison to 2012-13. High inequalities in the distribution of owned land are evident from the fact that while in 2018-19 large farmers account for only 0.7 per cent of the total households, their share in total owned area is as high as 28.67 per cent. It may be mentioned here that changes in distribution of owned land among different categories of households are consistent with trends in other states which could primarily be attributed to increasing marginalisation of holdings due to sub-division and fragmentation coupled with lack of alternative sources of employment (Sharma and Malik, 2021).

Table 3: Distribution of Agricultural Households and Area Owned, 2012-13 and 2018-19

	Number of Agricultural Households (million)		Area Owned (million ha)	
	Number		Area	
	2012-13	2018-19	2012-13	2018-19
Landless	0.28 (6.2)	0.40 (8.4)	-	-
Marginal	3.81 (84.9)	3.71 (77.1)	1.68 (56.55)	1.45 (41.76)
Small	0.29 (6.4)	0.53 (11)	0.73 (24.47)	0.69 (19.81)
Medium	0.09 (2.1)	0.13 (2.8)	0.42 (14.27)	0.34 (9.76)
Large	0.01 (0.3)	0.03 (0.7)	0.14 (4.71)	0.99 (28.67)
All Size	4.49 (100.0)	4.81 (100.0)	2.97 (100.0)	3.46 (100.0)

Source: Same as Table 1

Notes: Figures in parentheses are column percentages.

As shown in Table 4, the total number of operational holdings had declined from 6.15 million in 2012-13 to 5.66 million in 2018-19. However, there was a decline in the share of marginal households from 86.25 per cent 78.10 per cent during the same period. Considering the total operated area, while the share of marginal households had declined, that of the small households had increased, and shares of medium and large households had hardly changed. It is obvious that both in terms of number of operational holdings and area Odisha agriculture is dominated by marginal and small agricultural households.

The changes in the incidence of tenancy in Odisha are presented in Table 5. The number of households leasing-out land, per cent of households leasing-out land, absolute amount of land leased-out, and per cent of owned land leased-out have all declined in 2018-19 in comparison to their respective figures in 2012-13. Out of all these, proportions of households leasing-out land and owned land leased-out have significantly declined. Similarly, both the number and percentage of households leasing-in and percentage of owned land leased-in have decreased in 2018-19. Notwithstanding this, the amount of leased-in land has marginally increased from 1.177 million hectare in 2012-13 to 1.287 million hectare in 2018-19. This result is contrary to the Indian tenancy scenario. For example, Sharma and Malik (2022) found the

reverse tenancy in terms of distribution of leased in and leased-out land among households of different size categories to be more pronounced in agriculturally developed states. Moreover, in agriculturally backward states, most of the leased in and leased-out land was accounted for by sub-marginal, marginal and small households. But, in case of Odisha, there has been a reduction in both leased-in and leased out land as well as percentage of households who lease-in and lease-out. One of the important reasons for this trend may be the banning of tenancy practices in the state through legislation. Second possible reason could be the diversion of agricultural land towards other purposes in all districts, in general and in mining districts, in particular given that the mining sector in the state has grown significantly in recent years (Shah & Pattnaik, 2010; Mishra, 2010).

Table 4: Distribution of Operational Holdings and Area Operated, 2012-13 and 2018-19

Household Categories	Operational Holdings (million)		Area Operated (million ha)	
	2012-13	2018-19	2012-13	2018-19
Marginal	5.31 (86.25)	4.42 (78.1)	1.95 (56.12)	1.90 (50.98)
Small	0.63 (10.28)	0.96 (16.9)	0.86 (24.88)	1.15 (30.78)
Medium	0.18 (2.92)	0.24 (4.2)	0.49 (14.02)	0.51 (13.59)
Large	0.03 (0.54)	0.03 (0.6)	0.17 (4.98)	0.17 (4.62)
All Size	6.15 (100)	5.66 (100)	3.47 (100)	3.72 (100)

Source: Same as Table 1

Table 5: Tenancy in Rural Odisha, 2012-13 and 2018-19

Particulars	2012-13	2018-19
Number of households leasing-out land (in million)	0.7414	0.4392
Per cent of households leasing-out land	9.49	5.38
Amount of land leased-out (in million hectare)	0.346	0.284
Per cent of owned land leased-out	11.64	8.2
Number of households leasing-in land (in million)	2.9	2.612
Per cent of households leasing-in land	37.13	32.05
Amount of land leased-in (in million hectare)	1.177	1.287
Per cent of owned land leased-in	39.62	37.19

Source: Same as Table 1

Section III: Cost and Receipts from Cultivation and Animal Farming

As may be seen from Table 6, the average GCA and total cultivated area have increased for both the seasons in 2018-19 in comparison to these in 2012-13. This has increased the average per household GCA from 0.54 hectare to 0.60 hectare between the two time points. Similarly, the value of per household total production in Odisha has increased for both kharif and rabi seasons. More importantly, the average yield in value

terms has also increased recording an 18.5 per cent jump. These changes could be attributed to both increase in the yields of different crops and also their prices.

Table 6: Gross Cropped Area, Total Value of Production and Yield, 2012-13 and 2018-19

Particulars	Kharif Season 2012-13	Kharif Season 2018-19	Rabi Season 2012-13	Rabi Season 2018-19	Agricultural Year 2012-13	Agricultural Year 2018-19
Average per household GCA (ha)	0.67	0.75	0.42	0.46	0.54	0.60
Total cultivated area (million ha)	2.96	3.42	0.93	1.03	3.89	4.45
Average per household total production (Rs.)	22433	29349	14538	18683	18486	24016
Average yield (Rs./Ha)	32606	39342	34697	40439	33652	39891

Source: Same as Table-1

Table 7 shows that total input expenses and their CGR at current and constant prices in Odisha have increased between 2012-13 and 2018-19. Expenditure on human labour continues to be the major component of all inputs, followed by other expenses, and fertilizer/manure. Other expenses for crop production include charges paid for work done by others, cost of transportation, commission paid to the purchasing agents, etc. In total expenses, when we compare their respective figures for 2012-13 and 2018-19, percentage share of expenditure on seeds, interest, other expenses have increased whereas percentage share of expenditure on fertilizer/manure, plant protection chemicals, irrigation, minor repair and maintenance of machinery and equipment, rent, both human and animal labour have decreased. If we account for total expenses, per hectare net receipts for crop cultivation has increased during the two time points though at a much lower rate at constant prices.

Animal farming which includes dairy, poultry/duckery, piggery, fishery and farming of other animals has been playing a major role in the economy of farmers and seen as part of the modern agriculture sector. Animal farming may be practiced along with crop cultivation as mixed farming system where these both enterprises complement each other improving resource use efficiency or may be adopted as a single enterprise. As may be seen from Table 8, expenses on animal seeds, animal feed, veterinary, labour, other expenses have declined both at current and constant prices bringing down total expenses between 2012-13 and 2018-19. However, the worrisome fact is that receipts from animal farming in Odisha has declined significantly both at current and

constant prices. The significant reduction in receipts from animal farming may affect growth in income of agricultural households in Odisha which is discussed in the following section.

Table 7: Input Expenses and Receipts from Crop Production, 2012-13 and 2018-19 (Rs. per household)

Particulars	Current Prices		Constant Prices		Per cent Share		CGR from 2012-13 to 2018-19 (%/pa)	
	2012-13	2018-19	2012-13	2018-19	2012-13	2018-19	Current Prices	Constant Prices
Seeds	552	1464	75	154	4.60	7.69	17.65	12.85
Fertilizer/ manure	3312	4320	448	455	27.57	22.68	4.53	0.27
Plant protection chemicals	1032	1248	139	131	8.59	6.55	3.22	-0.99
Irrigation	180	264	24	28	1.50	1.39	6.59	2.24
Minor repair and maintenance of machinery and equipment	144	108	19	11	1.20	0.57	-4.68	-8.57
Interest	96	216	13	23	0.80	1.13	14.47	9.80
Lease rent for land	1224	1068	165	112	10.19	5.61	-2.25	-6.23
Labour (i) Human	3576	5556	483	585	29.77	29.17	7.62	3.23
(ii) Animal	240	216	32	23	2.00	1.13	-1.74	-5.75
All other expenses	1668	4572	225	481	13.89	24.01	18.30	13.48
Total expenses	12012	19044	1623	2005	100	100	7.98	3.58
Receipts (Rs. /ha)	29256	37944	3954	3994			4.43	0.17

Source: Calculated by the author from data compiled from source mentioned in Table 1

Section IV: Income, Indebtedness and Possibility of Doubling Farmers' Income

Data presented in Table 9 shows that while the annual nominal income of agricultural households in Odisha has increased marginally from Rs. 59712 in 2012-13 to Rs. 60996 in 2018-19 the real income has declined significantly from Rs. 8069 to Rs. 6421, growing annually at -3.74 per cent. In comparison to 2012-13, the major source of income in 2018-19 for Odisha's agricultural household is wages which accounts for 52.11 per cent of total income and it is followed by cultivation with a share of

30.87 per cent. Shares of income from animal farming and non-farm business have fallen in 2018-19 in comparison to their respective shares in 2012-13. One of the major reasons for stagnant annual nominal income and fall in real income in 2018-19 is the significant reduction in income from animal farming and non-farm income; respective CGRs point to the negative growth. Non-farm business covers manufacturing, mining & quarrying, trade, hotel and restaurant, transport, construction, repairing and other services.

Table 8: Input Expenses and Receipts from Animal Farming, 2012-13 and 2018-19 (Rs. per household)

Particulars	Current Prices		Constant Prices		Per cent Share		CGR from 2012-13 to 2018-19 (%/pa)	
	2012-13	2018-19	2012-13	2018-19	2012-13	2018-19	Current Prices	Constant Prices
Cost of animal seeds	972	660	131	69	16.17	14.03	-6.25	-10.07
Animal feed	3876	3312	524	349	64.47	70.41	-2.59	-6.56
Veterinary charges	576	528	78	56	9.58	11.22	-1.44	-5.46
Labour charges	360	60	49	6	5.99	1.28	-25.82	-28.84
All other expenses	228	144	31	15	3.79	3.06	-7.37	-11.15
Total expenses	6012	4704	812	495	100.00	100.00	-4.01	-7.92
Receipts	35004	12924	4730	1360			-15.30	-18.75

Source: Same as Table 7

Table 9 Source Wise Average Annual Nominal and Real Income of Agricultural Households in Odisha, 2012-13 and 2018-19

Income Sources	Nominal Income		Real Income		Percentage Share to Total		Compound Growth Rate during 2012-13 to 2018-19	
	2012-13	2018-19	2012-13	2018-19	2012-13	2018-19	Nominal Income	Real Income
Cultivation	16884	18828	2282	1982	28.28	30.87	1.83	-2.32
Wages	20592	31788	2783	3346	34.49	52.11	7.50	3.12
Farming of Animals	15768	4992	2131	525	26.41	8.18	-17.44	-20.81
Nonfarm Business	6468	5388	874	567	10.83	8.83	-3.00	-6.95
Total Income	59712	60996	8069	6421	100	100	0.36	-3.74

Source: Same as Table 7

As regards incidence of indebtedness among agricultural households in Odisha Table 10 shows that average amount of outstanding loan at current prices for all households has increased from Rs. 28200 in 2012-13 to Rs. 32721 in 2018-19, but at constant prices it has declined from Rs. 3811 to Rs. 3444. The proportion of indebted agricultural households in Odisha has increased from 57.52 per cent in 2012-13 to 61.23 per cent in 2018-19. Furthermore, average outstanding loan at both current and constant prices for marginal, small, and medium households have significantly increased implying higher incidence of indebtedness

among these categories of households. However, outstanding loans at constant prices for large households has recorded a negative growth rate implying that they are in a better position to repay their debt.

Table 10 Average Amount of Outstanding Debt per Agricultural Household, 2012-13 and 2018-19 (Rs./ha)

Size class of land (ha)	Average Amount of Outstanding Loan at Current Prices		Average Amount of Outstanding Loan at Constant Prices		CGR from 2012-13 to 2018-19 (%/pa)		Per cent of indebted agricultural household	
	2012-13	2018-19	2012-13	2018-19	Current Prices	Constant Prices	2012-13	2018-19
Margi	25217	58861	3408	6196	15.17	10.48		
Small	18100	37533	2446	3951	12.92	8.32		
Medi	32600	69977	4405	7366	13.58	8.95		
Large	20446	22263	27630	2343	1.43	-2.71		
All	28200	32721	3811	3444	2.51	-1.67	57.5	61.2

Source: Same as Table 7

Source-wise estimated income of agricultural households in Odisha in 2015-16 and the rate of growth required to double it by 2022-23 have been presented in Table 11. Our analysis shows that on the basis of nominal income in 2012-13 and the growth rate in the same during 2012-13 and 2018-19, annual nominal income in 2015-16 is estimated at Rs. 60137 which is expected to double to Rs. 120274 by 2022-23. This goal could be achieved if the state's agriculture sector grows at an annual rate of 18.50 per cent during 2018-19 and 2022-23; it is a herculean task given its past growth trajectory. It may be recalled that CGR of nominal income during 2012-13 and 2018-19 was only 0.36 per cent. Similarly, for Odisha to double income from cultivation and from wages, an annual growth rate of 16.78 per cent and 10.68 per cent, respectively, is required during 2018-19 and 2022-23.

Table 11 Doubling of Farmers' Income from Different Sources by 2022-23 and the Required Per Cent Per Annum Growth Rate between 2018-19 and 2022-23

Income Sources	Estimated Nominal Income in 2015-16 (Rs.)	Doubled Amount of Income in 2022-23 over 2015-16 (Rs.)	Required Growth Rate to Double Income by 2022-23 over 2018-19 (%/pa)
Cultivation	17509	35017	16.78
Wages	23799	47597	10.62
Total Income	60137	120274	18.50

Source: Author's estimation

Note: Respective growth rates for farming of animals and nonfarm business are not presented in the table as their CGR during 2012-13 and 2018-19 were negative.

Conclusion

The release of the report on Situation Assessment Surveys of Agricultural (SAS) Households and Land and Holding of Households in Rural India, 2019 by NSSO and its comparability with the data available in Situation Assessment Survey and Land Holding Survey 2012-13 offers an opportunity to analyse the changing dynamics of Odisha agriculture and also to explore the possibility if the objective of doubling farmers' income by 2022-23 is achievable. The analysis brings out a number of important changes in agriculture in the state. First, the number of agricultural households in the state and percentage of such households practicing cultivation have significantly increased. There is a clear sign of marginalization of farmers as landless agricultural households have increased and a preponderant majority of operational holdings are marginal and small holdings. Second, more than 50 per cent of the annual household income is derived from wages making this as a major source of income followed by cultivation. The income from animal farming and nonfarm business has decreased. Third, the incidence of indebtedness among marginal, small and medium agricultural households has increased. Fourth, during 2012-13 and 2018-19, the growth rate of real income has been negative. Keeping these in view, the average total income per agricultural household in the state is required to grow at a rate of 18.50 per cent per annum between 2018-19 and 2022-23 if farmers' income is to double by 2022-23. This seems highly unlikely given the past growth trajectory of average income of the agricultural households.

References

Basantaray, A. K., & Nancharaiah, G. (2017). Crop Diversification in Odisha Agriculture: An Empirical Study of Its Extent, Pattern, Determinants and Impact on Farm Income. Agricultural Economics Research Review, 30(Conference Number), 45–58.

Chand, R. (2017). Doubling Farmers' Income: Rationale, Strategy, Prospects and Action Plan. https://agricoop.nic.in/sites/default/files/NITI Aayog Policy Paper.pdf

Chandrasekhar, S & Mehrotra, Nirupam (2016). Doubling Farmers' Income by 2022: What Would It Take? *Economic and Political Weekly*, LI (18), 10-13.

Government of Odisha (2022). Odisha Economic Survey. Directorate of Economics and Statistics, Planning and Convergence Department, Bhubaneswar. Economic_Survey_2021-22_0.pdf (odisha.gov.in)

Mishra, Banikanta (2010). Agriculture, Industry, and Mining in Orissa in the Post-Liberalisation Era: An Inter District and Inter State Panel Analysis. *Economic and Political Weekly*, XLV (20), 49-68.

Mishra, S. (2009). Poverty and agrarian distress in Orissa (No. 2009–006). https://ideas.repec.org/p/ind/igiwpp/2009-006.html

NABARD & IFMR (2017). Doubling Farmers' Income: Strategies and Recommendations for Tamil Nadu, India. https://www.nabard.org/auth/writereaddata/tender/0301190115Ta mil Nadu%27s Report.pdf

NSSO. (n.d.). Consumer Expenditure. Retrieved April 1, 2022, from https://catalog.ihsn.org/index.php/catalog/3281

Paltasingh, K. R., & Goyari, P. (2013). Analysing Growth and Instability in Subsistence Agriculture of Odisha: Evidence from Major Crops. *Agricultural Economics Research Review*, 26(Conference Number), 67–78. https://www.researchgate.net/publication/270280347_Analyzing_Gr owth_and_Instability_in_Subsistence_Agriculture_of_Odisha_Evidenc e_from_Major_Crops/citation/download

Panda, S. C. (2015). Economic growth, inequality and poverty in Odisha. In R. K. Panda & R. K. Meher (Eds.), Trend, Magnitude and Dimensions of Inequality in Post Reform India. Concept Publishing Company. https://www.amazon.in/Trend-Magnitude-Dimensions-Inequality-Post-Reform/dp/9351251381

Sahu, J. P., & Panda, S. (2018). Political regime persistence and economic growth in Odisha: An empirical assessment of the Naveen Patnaik rule. *Economics Bulletin*, 38(1), 610–622.

Shah, A., & Pattnaik, I. (2010). Is There a Glimpse of Dynamism in Orissa's Agriculture? Economic & Political Weekly, 45(26–27), 756–759.

Sharma, H.R. & Malik, S. H. (2021). Land Distribution Structure, Marginalisation of Holdings and Dimensions of Viability Crisis in Indian Agriculture. *Indian Journal of Agricultural Economics*, 76 (2), 207-224.

Sharma, H.R. & Malik, S. H. (2022). Magnitude and Determinants of Reverse Tenancy: A Study of Agriculturally Developed and Backward States. *Journal of Land and Rural Studies*, 10 (2), 179-195.

Singh, S. (2020). Doubling Farmers' Incomes: A Critical Review of Policy. *Review of Agrarian Studies*, 10(2), 138–146.

Swain, M. (2014). Sources of Growth and Instability in Agricultural Production in Western Odisha, India. *Asian Journal of Agriculture and Development*, 11(2), 51–70.

Women's Agricultural Participation: A Case Study of Bhadrak District in Odisha

Manas Kumar Behera
Mitali Chinara

Abstract:

Women are essential to agriculture and related activities in rural Odisha, much like in many other Indian states and around the world. They remain busy from dawn to dusk performing agricultural activities in addition to their household chores, boosting their family income. They have made a big contribution, but their role has not yet been acknowledged. In the state of Odisha, studies on this subject are rare. This study is based on research that was done to find out how women were involved in agriculture in the Bhadrak of Odisha. A structured interview schedule was used to collect data from 210 respondents selected through a multistage random sampling design. The study found that women are actively involved in pre as well as post-harvesting operations, homestead gardening, and poultry and livestock rearing. Women engaged in agricultural activities hail from low socio-economic strata with low levels of literacy. They are self-motivated to join these activities to enhance the family income when it falls short to meet the family's needs. But these women do not have ownership rights over their land which stands as a hindrance to availing any facility provided by the government like credit or extension services.

Keywords: Agriculture, Women, Participation

I. Introduction

The primary means of subsistence for people in developing economies is agriculture, the oldest vocation in the world. Even if other industries in these nations have experienced significant growth, people's primary source of income remains agriculture and related activities. In addition to ensuring food security and reducing poverty in rural regions, the expansion of the agricultural sector is crucial for maintaining the expansion of the rest of the economy.

Manas Kumar Behera, Ph.D Research Scholar, Utkal University, Bhubaneswar.
Email: bmanas82@rediffmail.com

Mitali Chinara, Professor, Department of Analytical and Applied Economics, Utkal University, Bhubaneswar.
Email: mitalichinara@yahoo.co.in

More so since, the expansion of two non-farm sectors, secondary and tertiary sectors, can only be sustained if the agriculture sector keeps expanding, provides sufficient demand for goods and services, and supplies the system's wage goods. The statistics are more accurate for states like Odisha, where agriculture and related sectors employ more than 60 per cent of the state's population. (Krishnaraj & Kanchi, 2008, *Odisha Agricultural Statistics, 2017-18*)

The Indian economy is primarily an agriculture-oriented economy. 68.84per cent of India's population resides in rural areas in 6, 40,867 villages across India (Census 2011). Almost 70per cent of India's population relies on farm and allied activities, for living purposes. Thus, while the country's Gross Domestic Product as a per centage of agriculture (GDP) is falling over time, the number of people it supports remains almost steady. Thus, farming plays a crucial part in the well-being based on the preponderance of Indians in the sector besides providing the country with food security (Rukmani, 2013).

As wage workers, farmers, co-farmers, and unpaid family care givers, women are integral to the agricultural sector. Women take over as farm managers when the men migrate, forsake their wives, pass away, or are otherwise inactive at home for whatever reasons. Three-fourths of our women are in agriculture (Krishnaraj & Kanchi, 2008). They put a lot of effort into the preparation of the soil, seed selection, seedling production, sowing, application of manure, fertilizer, and pesticides, weeding, transplanting, threshing, winnowing, and harvesting of key grains. Most of the post-harvest refining of crops is also carried out by women. Even though it is frequently seen as an extension of domestic duties, caring for livestock takes up a substantial portion of their time and energy. It involves washing cattle, taking it for grazing, collecting fodder, cleaning cattle sheds, caring when the animal is sick, and milking and refining milk and other livestock products. For women in low-income families, raising small ruminants and backyard chickens is a significant source of income. In addition, females also do fish processing and collect non-timber products like fuel, fodder, leaves, nuts, and berries. Yet to this day, the image of the farmer is male! (Krishnaraj & Kanchi, 2008).

Although women are a conspicuous part of this workforce, visible in a wide range of activities, they appear far less numerous in our statistical counts due to the explicit and implicit bias in the definition of what constitutes productive work. Also, the value of the work they do and its contribution to national income goes unrecognized. Nevertheless, official data does help us understand the role and position of women in the labor market and to assess the quality of their employment (Krishnaraj & Kanchi, 2008).

As has been pointed out the agrarian economy of Odisha has more than 60 per cent population directly depending on the agriculture sector for

their livelihood. Women make up a sizable share of the labour force in the agriculture sector. There are more agricultural workers today than there were in the past, although there are fewer cultivators. In 2001, cultivators made up 31.7 per cent of the workforce and agricultural labourers made up 26.5 per cent, whereas in 2011, these numbers were respectively 24.6 per cent and 30 per cent. This indicates a 7.1 per cent decrease in the number of cultivators and a 3.5 per cent increase in the number of agricultural labourers (Census, 2001 and 2011).

Females are extensively involved in agriculture, especially in rural areas as males are migrating for better opportunities to urban areas. Hence, the major responsibility of agriculture is falling on the shoulders of females along with all the domestic work, residing in rural areas. The current study intends to comprehend the role that female farm labourers play and their financial contribution to the household income. It also attempts to identify and understand the prevalent difficulties and impediments faced by female agricultural laborers.

II.   Review of Literature

Many studies have been conducted regarding the participation of women in farming activities. As is well known, the wide involvement of women in agriculture is often referred to as the 'Feminization of agriculture.' When men's and women's roles are imbalanced, whether, in the home or the community, this is known as feminization, and the exodus of the male labor force from agriculture caused the feminization of agriculture (Jiggins, 1998; Das et al., 2020; Kawarazuka et al., 2022). Unprecedented demographic, socioeconomic, and environmental changes are taking place in rural landscapes.

In search of better prospects, there is an increasing trend of male population exodus from rural areas to urban areas and abroad. This is mostly due to the weak economic development processes that failed to produce sufficient income and work possibilities at home, political and economic changes, and globalization, which is accompanied by alluring employment chances offered outside of the place of residence. The security in rural communities is deteriorating, there are fewer job prospects, and subsistence farming is becoming less and less profitable and unable to provide for basic needs, all of which act as disincentives to living in rural areas. Due to this, women now have additional obligations in farming within traditionally male-dominant farming techniques on top of caring for children and the elderly. In addition to being wrong and unfavourable to women, this has also decreased the use and the output of the land, and at times is escalating food shortages. Women are quitting agricultural lands and implementing less intensive farming techniques.

There is concrete evidence that the feminization of agriculture has impacts on both social and economic spheres (Tamang et al., 2014;

Upreti et al., 2018). The feminization of agriculture may be more accurately described as the feminization of agrarian distress because women's increasing labour commitment to agriculture adds to the already onerous workloads of most rural women and undermines their well-being (Tamang et al., 2014; Pattnaik et al., 2018). Both the male and female agricultural participation has decreased, but male participation has decreased faster than female participation.

In addition, and this is crucial, the decline among women has been specially related to their responsibilities as cultivators, who oversee making decisions and allocating resources, while the proportion of women working as agricultural workers has stayed constant. This suggests that where women have the financial means to do so, they are abandoning agriculture (Pattnaik et al., 2018). Yet, women can contribute to increasing food security at all levels by being creative and active element of the agriculture sector (Kawarazuka et al., 2022). After liberalization, the non-agricultural sector employed almost half of the male labor in India, whereas this sector employed only 35per cent of the total employment for females. Except for Uttar Pradesh and Bihar, it was clear that the variations in involvement between men and women employees were least in those states where workers were mostly employed in agriculture. The dominance of women in the livestock sector is also significant. The per centage of land used for food grain, per capita income, and land ownership were some of the variables influencing the engagement of women in agriculture (Das et al., 2020). Because of the exodus of men from the labour force, local power structures and male-dominated relationships are under threat, which causes the surviving workforce and recipient clientele to become more feminine (Tamang et al., 2014; Mukhamedova and Wagerich, 2018). While female participation in the labour force is declining in many emerging nations, it is rising globally among women who work in agriculture. Employment in agriculture does not appear to be a means of empowering women because it has not yet resulted in a change in the lives of women though it has improved household food security (Martini and Pryck, 2015; Asadullah and Kambhampati, 2021).

Das (2015) found that in agriculture and its related fields, rural women make up most workers. Her work encompasses the cottage industry, livestock production, and crop production. It encompasses carrying water, fuel, and feed to performing maintenance on homes and families. Despite having such a significant impact, neither her role nor her dignity has yet been acknowledged.

Jatto et al., (2013) showed that women's interest in agricultural production was greatly influenced by their years of education, past agricultural experience, family size, farm size, and involvement in women's groups. The biggest factor influencing women's interest in agricultural production was their participation in women's groups. Khan et al. (2012) trace that most farmers in their study region

(Peshawar) were small landowners, with average holding sizes of 2 to 4 acres. Pre-harvest activities took up more time for women than post-harvest ones.

Chayal et al., (2010) pointed out that socioeconomic characteristics (age, family type, annual income, caste, education, and land holding) forced women to work in the agriculture field. Their study reveals that many women agricultural laborers belong to OBC, and SC & ST categories and have low literacy rates.

Mishra (2008) conducted a comparative study in the Cuttack and Dhenkanal districts of Odisha which indicates that 96 per cent of the Women Agricultural Labourers (WALs) were from backward castes and illiterate while most of them were landless. Only 6 per cent of them had land, though the land holdings were very small and they had a low standard of living. Forty per cent of the WALs took up farming in leased-in lands.

DRWA (2007) indicates that in Odisha, in contrast to the farmers in vegetable-based farming systems, who spent 8 hours 32 minutes per day on agricultural operations, rice farmers spent 16 hours 53 minutes per day on the same tasks. The women in vegetable and livestock-based farming systems spent more time on farming tasks than the women in livestock-based farming systems, but the women in all farming systems were solely in charge of household management tasks. NRCWA (2004) made a research study in Odisha which indicates that family women participated least in land preparation and worked maximum number of hours per season (61.66) in harvesting and post-harvesting activities. The same trend was seen in both paid and unpaid female labour for women overall.

The studies cited above intend to give a clear picture of women's participation in agricultural activities and the compulsions as well as constraints while doing so. The present study is an attempt at studying the same in an agricultural district of Odisha and to find out their participation in non-agricultural activities while being active in agriculture as well.

III.   Objectives
1. To examine various socio-economic characteristics of the rural women engaged in agricultural activities.
2. To determine and describe the nature and extent of participation of rural women in agricultural and non-agricultural activities.
3. To analyze the causes and determinants of participation of women in those activities.

IV.   Methodology and Data

To conduct this research, the Bhadrak district of Odisha was selected as the sample district due to wide availability of women agricultural labourers. As per 2011 census, in Bhadrak district the total number of cultivator workers and agricultural labourers is 150632 and 109744, respectively. On the other hand, the number of women agricultural labourers in the district is 32312, which is 29.44 per cent of total agricultural labourers. The district of Bhadrak consists of 7 numbers of block and from each block one village and from one village 30 numbers of respondents were selected by purposive random sampling methods, who are actively involved in agricultural activities along with their household duties, thus making the total sample as 210. Direct interviews were used to gather data on various socioeconomic characteristics using a pre-tested, organised interview plan and are analysed using appropriate statistical tools.

A Participation Index has been calculated for different agricultural and non-agricultural activities undertaken by women. Weights of 2, 1 and 0 are assigned if the activity is undertaken regularly, occasionally, or never respectively. A higher Participation Index for an activity indicates a higher level of participation of women in that activity.

V. Analysis and Findings
Profile Characteristics of Women Agricultural Labourers

Human beings have several interrelated and fundamental traits that affect how they adapt to their surroundings in a particular way. As a result, it is anticipated that rural women's engagement in various activities will be influenced by their socioeconomic characteristics. Socioeconomic characteristics of the sample 210 respondents have been provided in the following.

Table 1 displays the distribution of women agricultural labourers by age groups. It reveals that a considerable portion of the study's overall respondents—totalling 41.42 per cent of the women agricultural labourers—are in the age range of 41 and above. In second place, 37.61 per cent belong to the age group of 31 to 40 and 9.04 per cent to the 51–60 age bracket. From Table 2 we find that most of the respondents are married, and they constitute 95.23 per cent of the total respondents of the study.

Table 1: Age-wise Classification of Women Agricultural Labourers

Age-wise classification	Number of Women Agricultural Labourers (%)
Below 20	06 (2.85)
21-30	09 (4.28)
31-40	79 (37.61)
41-50	87 (41.42)
51-60	19 (9.04)
61-70	10 (4.76)
Total	210 (100.00)

Source: Primary Data, 2018

Table 2: Marital Status of Women Agricultural Laborers

Marital Status	Number of Women Agricultural Labourers (%)
Married	200 (95.23)
Unmarried	01 (0.47)
Widow	09 (4.28)
Total	210 (100.00)

Source: Primary Data, 2018

It was observed in the survey that all the women agricultural labourers are Hindu. Table 3 indicates that 9.04 per cent of women agricultural labourers belong to OBC and 80.47 per cent and 10.47 per cent belongs to SC and ST categories respectively. Thus, majority of the women agricultural labourers are from schedule caste and schedule tribe. As observed from the table above, women from relatively well to do families in rural areas typically do not work outside the home. They spend much of their time on childcare and other household chores.

Table 3: Caste-wise Distribution of Women Agricultural Laborers

Caste	Number of Women Agricultural Labourers (%)
General	0 (0)
OBC	19 (9.04)
SC	169 (80.47)
ST	22 (10.47)
Total	210 (100.00)

Source: Primary Data, 2018

Table 4 shows that 45 women agricultural labourers (21.42 per cent) have completed middle school education, whereas 43 respondents (20.47) per cent have completed primary education. 38 (18.09 per cent) respondents are functionally literate, and 37 (17.61 per cent) have completed high school. Only 8.57 per cent of these women are college educated and 29 respondents (13.80 per cent) are illiterate. Table 5 shows that majority of the WALs (85.23 per cent) have medium sized families, having family members varying between 3 to 5. Apart from this the per centage of large and small sized family is 8.09 per cent and 6.66 per cent, respectively.

Table 4: Educational Status of Women Agricultural Labourers

Educational Status	Number of farm women (%)
Illiterate	29 (13.80)
Functionally Literate	38 (18.09)
Primary	43 (20.47)
Middle School (Up to seven class)	45 (21.42)
High School	37 (17.61)
College	18 (8.57)
Total	210 (100.00)

Source: Primary Data, 2018

Table 5: Family size of the Women Agricultural Labourers

Size	Number of Women Agricultural Labour (%)
Small (up to 2)	14 (6.66)
Medium (3-5)	179 (85.23
Large (6 & above)	17 (8.09)
Total	210 (100.00)

Source: Primary Data, 2018

Table 6 indicates that majority of the WALs are land less. 49.52 per cent of WALs do not have their own land followed by this, 22.38 per cent are having land up to 0.5 to 1 acre, 20.47 per cent are having land holding up to 1-2 acre and 7.61 per cent have meagre land holding up to 0.5 acre.

Table 6: Land holding pattern of the Women Agricultural Labourers

Area	Number of Women Agricultural Labourer (%)
Up to 0.5 Acre	16 (7.61)
0.5 to 1 Acre	47 (22.38)
1-2 Acre	43 (20.47)
No Land	104 (49.52)
Total	210 (100.00)

Source: Primary Data, 2018

The monthly income of women agricultural labourers from all sources is very low. Table 7 indicates that 72.85 per cent of the respondents have a monthly income of less than Rs.7000-10000. 21.90 per cent of the respondent's monthly income is above Rs.10000 and 5.23 per cent of the respondent's monthly income is less than Rs 7000.

Table 7: Monthly income of women agricultural labourers (in Rs.)

Monthly Income (Rs.)	Number of women Agricultural labourer
Below 7000	11 (5.23)
7000-10000	153 (72.85)
Above 10000	46 (21.90)
Total	210 (100.00)

Source: Primary Data, 2018

Taking Part in Various Agricultural Activities

The term "participation" implies taking part in activities or events, on one's own or alongside others. Participation is often consequential to a need. Women in rural areas usually lead hectic and tough lives. Her shifts begin at sunrise and last till midnight. Housekeeping, fetching drinking water, dishwashing, laundry, preparing meals for the family, and child care are the first tasks of the daily routine. Moreover, they engage in a variety of agricultural activities. Table 8 depicts the participation indices, rank order, and a distribution of respondents by how much they participated in various agricultural activities.

T**able 8: Extent of participation in various agricultural and non-agricultural activities**

Sl. No	Items of Operation	Extent of Participation			Particip ation Index	Ra nk ord er
		Regul arly	Occasio nally	Ne ver		
Agricultural activities						
1	Land Preparation	0	64	146	64	
2	Applying manure	12	96	102	120	
3	Uprooting seedling	63	80	67	206	
4	Transplanting seedling	93	67	50	253	
5	Applying fertilizer	56	72	82	184	
6	Drain preparation	0	89	121	89	
7	Weeding	93	67	50	253	V
8	Applying irrigation	0	72	138	72	
9	Fencing	0	67	143	67	
10	Applying insecticides	0	92	118	92	
11	Homestead gardening	109	58	43	276	III
12	Harvesting	132	78	0	342	
13	Post-harvest operation	132	78	0	342	I
14	Storage	107	46	57	260	IV
15	Rearing Poultry	60	59	91	179	
16	Rearing Livestock	124	42	44	290	II
Non-agricultural activities						
1	Construction work	107	55	48	269	I
2	Petty business	58	112	40	228	II
3	Paper Plate making	39	58	113	136	
4	Sewing	0	119	91	119	
5	Buying daily requirements	54	109	47	217	III
6	Making cow dung cake	51	92	67	194	IV
7	Prepare value added product	0	87	123	87	
8	Agarbati Making	58	42	110	158	V

Source: Primary Data, 2018, Authors' calculation
Note: Participation index= Regularly x 2 + Occasionally x 1+ Never x 0.

There are three categories for work participation: regular, occasional, and never. The weighted scores for these categories are 2, 1, and 0, respectively. Table 8 shows that many women agricultural labourers are involved in harvesting and post-harvest operations, rearing of

livestock and homestead gardening as their ranks are I, II and III respectively in terms of Participation Index (PI). In the harvesting and post-harvest operations 132 (62.85 per cent) respondents are regularly involved, and 78 (37.14 per cent) are occasionally involved. It is vitally important to handle the crop with extreme caution after harvest in order to prevent damage. To prevent moisture content, other chemical reactions, or additional deterioration like cutting, crushing, or bruising, several procedures are carried out such as drying, cleaning, sorting, and packing the produce. The quality of the crop is strongly influenced by these post-harvest procedures. Hence, it demonstrates the vital role that WALs play in preserving the quality of the crops that are produced.

In this particular study, out of 210 respondents, 124 (59.04 per cent) respondents are regularly involved in is rearing of livestock, with the second highest PI and 42 (20 per cent) are occasionally involved in the same. The main subsistence activity used to supplement farm incomes and provide for family food needs is raising livestock. The majority of them keep some animals, primarily cattle, goats, etc. According to earlier research, rural women do supplement their income by selling milk and livestock.

Many women in the study area are engaged in caring for the animals, cleaning the barns, and milking and watering them. Besides, they collect the dung and make dung cakes, a task that helps disadvantaged households earn extra money. The other livestock supervision tasks, leaving aside grazing, are predominately carried out by women. It is clear that women are mostly involved in the raising and managing of animals.

For the women agricultural labourers in the research area, homestead gardening is the activity with the third-highest PI and the third-highest participation rate. In homestead gardening operations, women do participate in decision-making. They have a back yard garden where they cultivate a variety of greens that aid in providing food and nutrition for their family. Homestead gardening is a regular activity which engages 109 (51.9 per cent) women agricultural labourers on a regular basis and 58 (27.61 per cent) of them on and off.

Storage is the fourth most common activity in which respondents participate, with 107 (50.95 per cent) participating regularly and 46 (21.90 per cent) participating occasionally. In order to prevent damage to the produce by rats and other pests, it is crucial to store the crops appropriately after drying, washing, and sorting them. It is a task mostly done by the women.

Another activity which is performed mainly by the female farm labourers participate the most is weeding. In the survey, 67 (31.9 per cent) and 93 (44.28 per cent) of the respondents said they occasionally and often weeded respectively. Weed growth must be controlled

because it can hinder crop development or degrade crop quality by polluting the final product. The annual weeds must be pulled by these female labourers for the plants to grow.

Female agricultural labourers are taking predominant role in uprooting the seedlings. This activity is done by women agricultural labourer in bending posture with long hours in direct sunlight and muddy soil which causes various infectious skin diseases. The study indicates 63 (30 per cent) women agricultural labourers are involved regularly and 80 (38.09 per cent) are involved occasionally in these activities to ensure the growth of the plants.

Transplanting seedling is a major and unique activity which is performed by women in direct sunlight with muddy feet, which indirectly causes various skin and foot diseases. In our study 93 (44.28 per cent) women agricultural labourers are involved regularly, and 67 (31.90 per cent) women are doing it occasionally.

So, women who work as agricultural labourers participate in a substantial portion of these tasks and make significant contributions to the production of animals, food security, etc. Unfortunately, in certain other tasks, their contribution falls short of expectations. In this study, women labourers were found not active in grading, fencing, opening up drains, or ensuring irrigation.

Apart from the agricultural involvement, there are some non-agricultural activities that were carried out by the women agricultural labourers to support their family income as well as for self-sufficiency. The common domestic chores like cooking, watching children, doing laundry, and cleaning the house were not considered in this study. The second section of Table 9 demonstrates that the engagement of women farm labourers in construction work is highest, petty business is second highest, and purchasing daily necessities is third highest (with highest, second highest and third highest PIs, respectively). Preparation of cow dung cake is another important activity carried out by women agricultural labourers either regularly or occasionally to boost their family income. Preparation of incense sticks (agarabati) is also another non-agricultural activity carried out by women agricultural labourers in their leisure time for self-sufficiency as well as for financial contribution to their households.

Reasons for Participating in Different Activities

The involvement of rural women agricultural labourers in diverse farm and non-farm activities can be attributed to a variety of reasons. The primary ones, according to this study, are to satisfy family needs, lack of male wage earners, enhancing family income, catering to personal needs, and supporting family requirements. These rationales are not mutually exclusive. Here, an effort has been made to identify the top

three reasons. The respondents of this survey were asked to rank the preceding causes in order of significance. After giving causes in order I, II, and III, respectively, weights of 3, 2, and 1, the final rank order was determined. Table 9 lists the key justifications for rural women's participation in various agricultural activities, broken down by rank.

Table 9: Reasons of Women's Employment in a Variety of Agricultural Work

Reasons	Order			Total Score	Final Rank
	I	II	III		
To take care of the basic Family requirements	111	59	40	491	I
Absence of male farming members	61	65	40	353	IV
Low family Income	73	65	72	421	II
To meet Personal Need	50	63	59	335	V
To meet Additional family requirements	61	58	96	395	III

Source: Primary Data, 2018, Authors' calculation
Note: Total Score=Ix3+IIx2+IIIx1

From Table 9 it is obvious that meeting the basic family needs has the highest total score of 491. Here, 111 (52.85 per cent) respondents ordered it as their first reason for which they work, 59 (28.09 per cent) regarded it as the second most crucial justification, and 40 (19.04 per cent) listed it as the third important reason.

Low family income is the second important reason for women's participation in various agricultural activities. Here, 73 (34.76 per cent) respondents regarded it to be the first important reason why they work, 65 (30.95 per cent) viewed it as the second, and 72 (43.28 per cent) respondents assigned it as the third important reason. Low levels of income forced them to participate in the agricultural sector.
Apart from this, there are some other needs in the family i.e., children's education, medical expenses, social obligations like marriage, or other unanticipated circumstances, etc. To meet these expenditure rural women participate in various agricultural works.

VI.   Conclusion

There is unquestionable proof that women carry the delicate burden of Indian agriculture today. Close to 50per cent of men, 70per cent of women, and 85per cent of women in rural areas still work in agriculture (Krishnaraj & Kanchi, 2008). Women continue to work in agriculture despite the fact that males are leaving the sector primarily due to the fact that they have nowhere else to turn. It is a crucial sector that has been overlooked in policy over the past few decades as reflected in decreased public investment, which has led to low yields and cultivation costs that are significantly higher than the revenues from it.

Given the size of our country and its arable land, neglect of this sector bodes ill for the alleviation of rural poverty, especially women's poverty, and our nation's food security, and conservation of our rich bio-diversity.

Women are play crucial roles in harvesting, post-harvest operations, domestic gardening, livestock and poultry rearing, and other agricultural and non-agricultural activities. They are being forced by economic pressure to depart from their traditional roles as housewives and work as agricultural and non-farm labourers. The summary of the present study's findings also allows for the drawing of the following specific conclusions:

- There is a plethora of agricultural and non-agricultural occupations that rural women engage in.
- Women who work in agriculture are typically engaged in homesteading activities including farming, harvesting, and animal husbandry.
- The primary motivation for women seeking jobs or participating in a variety of activities is to support their families and supplement the family earnings.

References

Asadullah, M. N. & U. Kambhampati, U. (2021). Feminization of farming, food security and female empowerment. *Global Food Security, 29*, 1-12.

Bhawana, K.C. & D. Race (2020). Women's approach to farming in the context of feminization of agriculture: A case study from the middle hills of Nepal. *World Development Perspectives, 20*, 1-12.

Census of India. (2011). *Population Projections for India and States 2011-2036.* Nirman Bhawan, New Delhi: National Commison on Population Ministry of Health and Family Welfare

Chayal, K., B. L. Dhaka & R. L. Suwalka (2010). Analysis of Role performed by Women in Agriculture. *Humanity & Social Sciences Journal, 5*(1), 68-72.

Das, A., S. Mohapatra, S. & N. M. Patnaik (2021). Feminization of Indian Agriculture: A Review. *Agricultural Reviews, 42*(4), 434-439.

Das, L. (2015). Work Participation of Women in Agriculture in Odisha. *IOSR Journal of Humanities and Social Science, 20*(7), 66-78.

Directorate of Research for Women in Agriculture. (2007). *Gender issues for technological empowerment of Women in Agriculture. DARE/ICAR, Annual Report 2006-07.*

Directorate of Research for Women in Agriculture. (2008). *Gender issues for technological empowerment of women in Agriculture. DARE/ICAR, Annual Report 2008.*

Farid, K. S., L. Mozumdar, M. S. Kabir & U. K. Goswami (2009). Nature and Extent of Rural Women's Participation in Agricultural and Non-agricultural activities. *Agricultural Science Digest, 29*(4), 254-259.

Government of Odisha. (2011). *District Statistical Handbook 2011, Bhadrak.* Bhubaneswar, Odisha: Director of Economics and Statistics.

Jiggins, J. (1998). The Feminization of Agriculture. *The Brown Journal of World Affairs, 5*(2), 251-262.

Kawarazuka, N., C. R. Doss, C. R. Farnworth & R. Pyburn (2022). Myths about the feminization of agriculture: Implications for global food security. *Global Food Security, 33*, 1-8.

Kelkar, G. (2009). *The feminization of agriculture in Asia: Implications for women's agency and productivity.*

Khan, M., M. Sajjad, B. Hameed, M. N. Khan & A. U. Jan (2012). Participation of women in Agriculture activities in district Peshawar. *Sarhad J.Agric, 28*(1), 121-127.

Krishnaraj, M. & A. Kanchi (2008). *Women Farmers of India.* New Delhi, India: National Book Trust.

Martini, M. A. & D. J. Pryck (2015). Does the Feminisation of Agricultural Labour Empower Women? Insights from Female Labour Contractors and Workers in Northwest Syria. *Journal of International Development, 27*, 898-916.

Mishra, S. (2008). Life of Women Agricultural Labourers in Orissa. *Orissa Review*, 54-57.

Mukhamedova, N. & K. Wegerich (2018). The feminization of agriculture in post-Soviet Tajikistan. *Journal of Rural Studies, 57*, 128-139.

National Research Centre for Women in Agriculture. (2004). *Gender Issues for Technological Empowerment of Women in Agriculture, DARE/ICAR Annual Report 2003-2004.*

Pattnaik, I., K. L. Dutt, S. Lockie & B. Pritchard (2018). The Feminization of Agriculture or the Feminization of Agrarian distress? Tracking the Trajectory of Women in Agriculture in India. *Journal of the Asia Pacific Economy, 23*(1), 138–155.

Rukmani. (2013). Factors leading to the involvement of Women in Agriculture: A case study of Purkal Gram Panchayat, Sahapur Block, Dehradun. *International Journal of Business and Management Research, 3*(12), 519-522.

Satyavathi, C. T., C. Bharadwaj & P. S. Brahmananda (2011). Role of farm women in agriculture: Lessons learned. *Gender, Technology and Development, 14*(3), 441-449.

Sharma , S., A. Dubey & R. Sharma (2012). Participation of Rural Women in Agricultural Activities: A study of March Block of Jammu District. *International Journal of Scientific and Research Publication, 2*(7), 1-3.

SOF Team, & C. Doss (2011). The Role of Women in Agriculture. *The Food and Agricultural Organization of the United Nations*.

Tamang, S., K. P. Paudel & K. K. Shrestha (2014). Feminization of Agriculture and its Implications for Food Security in Rural Nepal. *Journal of Forest and Livelihood, 12*(1), 20-32.

Upreti, B. R., Y. Ghale, S. Shivakoti & S. Acharya (2018). Feminization of Agriculture in the Eastern Hills of Nepal: A study of Women in Cardamom and Ginger Farming. *SAGE*, 1-12.

Public Policies in Time of Tenancy Revival: Case of Lump-sum Transfers in Agriculture

Mrityunjay Pandey
R. Vijay

Abstract

In the last five years, to mitigate agrarian crisis, a policy of lump-sum money transfer to agricultural land owner, was adopted by the Government of India, the Government of Telangana, and the Government of Odisha. This article, firstly, highlights the shift in rural public policy regime from support to 'cultivator of land' to 'owner of the land' (which is total reversal of land reform/tenancy reform public policies) and then it analyses the effectiveness of this public policy shift to address the crisis of most distressed farmer; the landless tenant cultivator. Secondly, it tries to bring out the possible impacts of this new policy regime on rural land market in the long run.

Keywords: Agrarian Distress in India, State Intervention, Land ownership, Tenancy, Land operational, Rythu Bandhu, KALIA, and PM-KISAN

1. Introduction

One of the dominant opinions on the rural/agrarian sector is that it is passing through a phase of distress (Ramachandran & Rawal, 2009; Ramakumar, 2010, 2022; Sajjad& Chauhan, 2012; Roy, 2017; Jodhka, 2018; Roy, D., 2021). The crisis faced by the cultivators has come to the

_____

Mrityunjay Pandey, Research Scholar, School of Economics, University of Hyderabad and Technical Assistant, Office of the Vice Chairperson, Kerala State Planning Board, Thiruvananthapuram, Kerala.
Email: mrityunjaypandey79@gmail.com

R. Vijay, Professor of Economics, University of Hyderabad.
Email: rvijay.uoh@gmail.com

focus. There are two major indicators of this crisis to this particular group. First, mass scale suicides committed by the farmers in almost all agro-climatic zones including the irrigated areas and farmers who have diversified to high valued crops. Second, a series of farmers agitations; the important ones being, the year-long massive farmers' struggle at the borders of Delhi against the three farm bills and for legal assurance of Minimum support price (MSP), the farmers' long march in Maharashtra, and the massive farmers' struggles in Mandsaur in Madhya Pradesh and Sikar in Rajasthan. These struggles had been led by various farmers' organisation and demanded for a pro-farmer public policy intervention. One genesis of the problem is 'profitability squeeze' arising due increasing input prices and declining output prices in the present context (Ramachandran & Rawal, 2009; Roy, 2017; Ramakumar, 2022). The response of the farmers was to ask for minimum support prices with legal assurance to make agriculture viable. The second reason for the crisis is the increasing importance of intermediaries in the organising of production, reversal of land reforms with increasing ground rents and dependence on informal loans in the post 1990s (Ramakumar, 2010; 2022). In their study of Punjab (Singh & Bhogal, 2015) present a case where agriculture could be growing but the farmers are in distress due to the presence of commission agents. This has led to a demand for re-organisation of market channels in the economy.

This distress in the agrarian economy and the cultivators, particularly, have taken a centre stage in the political discourse. There are multiple public policy interventions being discussed to address these problems and try to access their votes. The Indian National Congress promised to waive off loans in multiple state assembly elections. In the runup to assembly election in 2018 and 2019 two regional parties, TRS (Telangana) and BJD (Odisha) had introduced policies in which the State provides money to the farmers so that they can organise production, in their respective states. In the 2019 parliament election, political parties have once again identified public policy interventions as tool to mitigate farmer's distress. The Bharatiya Janta Party (BJP), may be taking idea from TRS, introduced a policy to provide lump sum money transfer to landowners. The Indian National Congress (INC) also put *nyay* scheme as primary poll plank, which is to give lumpsum income support.

The public policy to transfer income to land owners, might have come as an immediate policy proposal to attract the voters from rural locations before elections. However, all the policy initiatives are smoothly running, and it appears to be continuing for quite some time (Reddy, 2022; Shankar, 2022). This paper enquires into what can be the long-term impact of this policy regime and whether this policy shift can mitigate (at least to some extent) the crisis faced by the most depressed farmers or are they excluded from the scheme.

2. Unconditional Direct Income Transfer Policies

The TRS government have introduced a lump sum money transfer to land owners in Telangana state. K. Chandrasekhar Rao (KCR) launched the Agriculture Income Support Scheme (*Rythu Bandhu*) on May 10, 2018. The scheme covers land owners wherein each land owner gets Rs. 4,000 per acre, twice a year for total land owned. Transfers are in the beginning of the season to provide them with working capital. Beneficiaries are identified from the land records of revenue department. It is an advance direct transfer of working capital. This intervention is expected to reduce the dependency on informal credit and enhance productivity and ultimately leads to higher agricultural production (http://rythubandhu.telangana.gov.in, accessed on September 10, 2022).

On December 21, 2018, the Govt. of Odisha launched the Krushak Assistance for Livelihood and Income Augmentation (KALIA). The policy states that financing agriculture and insuring cultivators is essential to eradicate poverty and boost Odisha's economy. It has three different strata of beneficiaries: small and marginal farmers, landless labourer and vulnerable cultivators (senior citizens, differently abled and suffering from chronic diseases etc.). Assistance to small and marginal farmers is Rs 5000 per family per season. This policy has provision to support the landless labourer household with Rs 12,500. However, it is a onetime support for those who initiate any primary sector activities such as fisheries, poultry, beekeeping, mushroom cultivation (http://www.kalia.co.in, accessed on 10 September 2022).

Two months before the general elections, on February 1, 2019, the BJP led NDA government launched the Pradhan Mantri- Kisan Samman Nidhi (PM-KISAN). Through this scheme the government of India does a direct transfer of Rs 6000 to all small and marginal farmers owning land less than 2 hectare. It is applied from December 2018 and money is distributed in three instalments (https://pmkisan.nic.in/, accessed on September 10, 2022).

Although these policies are meant to enhance agricultural investment through direct income support, all policies are effectively taking owners as beneficiary criterion not cultivators. However, if there is a distress it is for the households who operate the land i.e., the actual farmers and not those who own land but do not cultivate.

We found two major issues with these policies in mitigating agrarian crisis. They are the following: First, the amount of money provided by the policy is meagre; compare to cost of cultivation of farmers as it might not make a dent on conditions generating distress. Second, small and marginal farmers might have taken this as a loan to meet consumption needs. Thus, the provision of advances for production purpose could be diverted to the consumption needs and in the process the objective

of the policy might not be met. The third issue that arises is the impact on agricultural sector growth, a transfer of money to meet working capital need of farmers does not automatically get translated into agricultural sector growth. This can happen only if there is an increase in input usage.

3. Farmer, Land Owner and Cultivator

All the three policies were expected to provide some transfer to the farmer so that they can access inputs and organise production. NSSO-SAS 77th round defines agricultural household/farmer household as a household receiving value produce of more than Rs. 4000[1] from agricultural activities and having at least one member self-employed in agriculture either in principal or subsidiary status during last 365 days (NSSO, 2021). Above definition identifies farmer as one who operates the land, does not specify anything on ownership of the land.

All the three policies discussed above, have considered farmers as beneficiaries. However, while defining the farmer, only land ownership criteria is considered, not land operation. If the separation of owner and operator is minimal or decreasing overtime, land ownership is a good indicator of operator and could be used as an index for farmer. There are two conditions wherein land owned and land operated could be different; first, when the land is kept fallow and second, when the land is contracted out to another household to cultivate, this is identified as a lease contract (tenancy).

Picture 1: Share of Owner Cultivator, Tenant, and Landless Tenant among Total Tenant Cultivator, in India, 2018-19 (in %)

Data
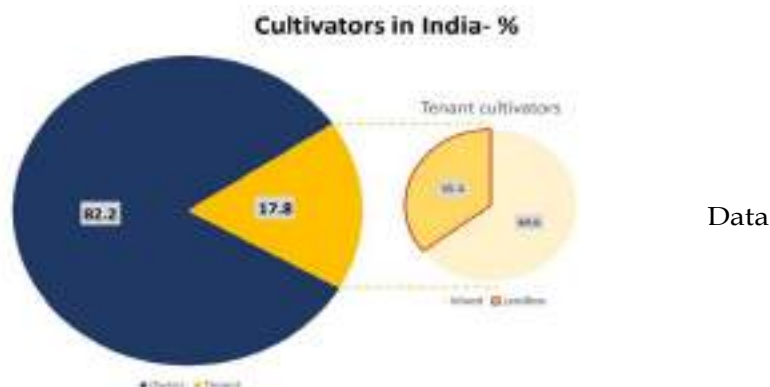
source: NSSO, 2021.

In both cases the lump sum transfer can be seen as returns to households for owning land not organising 'unviable agriculture'. In other words, these can be seen as ground rent the state pays to these landowners just

---

[1] It was Rs. 3000 in (NSSO, 2013).

for owning land not for taking part in production activity. A third hypothetical condition where separation between owner and operator does not matter is when the owner receives the money and transfer the money to operators. However, this does not look happening.

Last three rounds of land and livestock survey of NSSO has shown revival of the agriculutral land tenancy in India (Murali & Vijay, 2017; Bansal, Usami, & Rawal, 2018; Bhattacharya, 2019). Here, we present two sets of information on separation between owner and operator i.e., tenancy contract. At all India level, the proportion of the tenant household to cultivator households increased from around 9.9 per cent in 2002-03 to 17.8 in 2018-19. The extent of land 'leased in' to total land cultivated also increased from 6.5 per cent to 13 per cent during this period. This pattern should be seen in the context where tenancy in India is mainly informal and recorded tenancy is an underestimate of actual tenancy. The two states which have introduced policies to hedge farmers against the distress have witnessed a significant increase in land under tenancy. In case of Odisha, the share of tenant households to total cultivator households has increased from 19.4 per cent to around 39 per cent during 2002-03 to 2018-19, while the leased in area to total cultivated area also increased from around 13 per cent to 31.3 per cent during this period. In the case of Telangana, the proportion of tenant households at the time of bifurcation of Andhra Pradesh and formation of Telangana state was 18.4 per cent of total cultivator households. And total leased in area as share of total land operated was 13.7 per cent. In both states, the share of tenant to total cultivator is high. In the case of Odisha, it is showing secular increasing trend with rapid pace.

Table 1: Tenant Households as a Proportion of Cultivator Households and Leased-In Land as a Proportion of Total Operated, India, Odisha and Telangana, 2002-03 to 2018-19 (in %)

Year	India		Odisha		Telangana	
	Tenants as a proportion of cultivator household	Leased-in land as a proportion of total operated land area	Tenants as a proportion of cultivator household	Leased-in land as a proportion of total operated land area	Tenants as a proportion of cultivator household	Leased-in land as a proportion of total operated land area
2002-03	9.9	6.5	19.4	13	NA	NA
2012-13	13.7	10.2	20.6	16.7	18.4	13.7
2018-19	17.8	13	39	31.3	17.5	11.9

Source: Land and Livestock Survey, NSSO 2002-03, 2012-13, 2018-19

The question which arises here is that is the distress of a tenant farmer more than a distress of other cultivators? A tenant has an additional cost

of paying rent to the land owner as compared to the owner cultivators. Village based studies have identified that a tenant has to pay in and around 30 per cent of the output as rent to the land owner and they also face rigidity in accessing formal institutional support (Sharma, 2005; Ramachandran, Rawal, & Swaminathan, 2010; Bansal G. , 2020; Dhar, Pandey, & Kumar, 2022). Using NSSO, SAS-70th round, it can be estimated that the rent is around 21 per cent of the gross value added (NSSO, 2013). If one assumes that farmers are in distress, then distress of the tenant households is more when compared to households in similar land operation size category.

In Telangana state, the rythu bandhu scheme is giving benefit, Rs 8000 per acre per year without any upper limit over total ownership and need to cultivate. Here, around 20 per cent of cultivators are tenants and they would not be getting any benefit from the scheme.

The political leadership of the state does recognise this issue but posed as these might exist but are not a legal entity, thus cannot be recognised to avail lump sum transfer. Hans India reported KCR statement as "There is no clarity as to who is a tenant farmer. The government is not having details of tenant farmers and there is also no mention about the details of tenants nowhere in the official records. The so-called tenant farmers shall not have any right on the land. …it is not acceptable to provide investment support to those who have no right on the land and do not possess any document to prove the right. He felt that in the name of tenant farmer, it is not correct to do injustice to the original farmer" (https://www.thehansindia.com, 2018, accessed on September 20, 2022).

KCR takes a legal outlook on the issue that if something does not exist legally then it also does not exist in reality for the state. Households which are owns land will get the incentives and the size of ownership is not a barrier to get the transfer. If a household owns 10 acres of land, it would also get rupees 80,000 per year; irrespective of whether they cultivate or not. But in the process, the representatives of the State do not want to do injustice to original farmers but are ready to do injustice to the tenant as the state machinery does not recognise them.

In the tenant households, the pure tenants (Landless labour households who lease in land) are more exposed to the vagaries of intermediaries and are in need of access to formal institutions to meet ends, they do not have access to even Kisan Credit Card (KCC). At all India level in 2018, the proportion of landless tenants out of total tenants' is 35.4 per cent, in Odisha this statistic is 32.1 per cent and in Telangana it is 37.8 per cent (NSSO, 2021).

Picture 2: Share of Owner Cultivator, Tenant, and Landless Tenant among Total Tenant Cultivator, in Odisha, 2018-19 (in %)
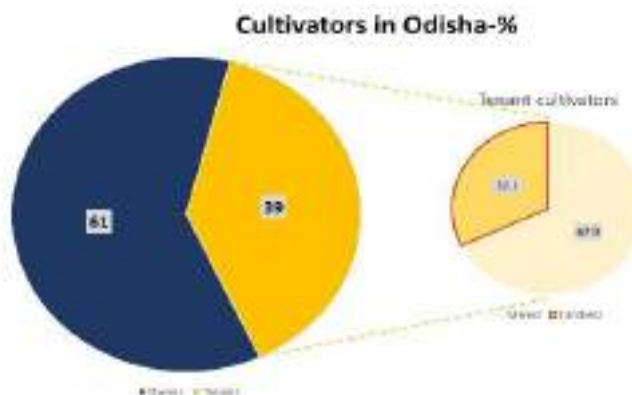
Picture 3: Share of Owner Cultivator, Tenant, and Landless Tenant Among Total Tenant Cultivator, in Telangana, 2018-19 (in %)
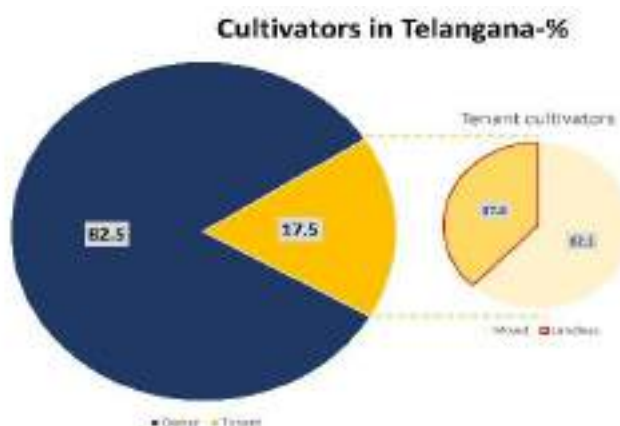
Data Source: NSSO, 2021

It is these segments which face the maximum distress but are excluded for all the benefits. Over time these segments are growing in share to total tenants. In 2012, it is 33.5 per cent for all India, 17.2 per cent for Odisha and 26.4 per cent for Telengana (NSSO, 2013). This is big share of total tenant and cultivators, but are getting excluded from the public policy interventions.

4. Conclusion:

In the recent period, there is a search for public policy to mitigate the crisis of the farmers. One of the public policy interventions emerged is the provision of lump sum transfer to land owners. This note makes an attempt to raise some concerns on this policy. The concerns were the

existing separation and increasing separation between owner and operator, so the growing importance of tenant households in the rural scene. In the evolving agrarian structure, tenancy is becoming an important arrangement to organise production. At all India level, around 20 per cent of farmers are tenants and, in these tenants, nearly 30 per cent are pure tenants. The distress of tenant farmers is more severe when compared owner operated farmers. The policies are ignorant towards this aspect. If tenancy is going to become an important arrangement one needs public policy to address the distress of these households.

Earlier, public policies related to agriculture attempted to protect the operator/tenant such as land reform policies, tenancy reforms and green revolution policies. These policies attempted to protect the land operator so that these households can have the incentives to increase production. But the recent policies, starting from the land acquisition, 2013, protect land owner but do not have any provision of safe guarding interest of landless labourer and tenant cultivators. This clearly points out to a shift which emphasises on protecting the land owner over protecting the land operator. One obstacle which is often emphasized by ruling parties is the lack of information on land operator. In that case there is a need to search for indicators to find who is operating the land, particularly in the phase of tenancy revival. This is only possible through a public action such as 'operation barga' to ensure formalisation and democratisation of land relations.

A related question is what will be the long-term impact on agriculture by this policy regime? These policies do not have a time horizon and all of them have been keep going since their inception. If one assumes this policy regime to be continued, one would expect the land prices to increase making the market more inactive. Because, these policies are nothing but 'ground rent' paid by the Government to land owner. Which is additional incentive for holding land, even if not operating. An increase in the price of land makes land a more preferred store of value which has the potential to generate more non-cultivating households from urban areas who have a surplus and looking for avenue for investment.

So, the Indian state has to identify the root causes of the agrarian distress and also the reasons behind increase in production cost, stagnancy in productivity enhancing technological breakthrough and constant decline in output prices. At this juncture Indian agriculture needs vital intervention from Indian state for constant enhancement of productivity through technology enrichment, also political conviction in policy framework to reduce share of 'rent seekers' (rentiers, moneylenders and intermediaries) in total production.

Bansal, G. (2020). Tenancy and Accumulation: A study of Capitalist farm sector in Punjab. *Review of Agrarian Studies*.

Bansal, V., Usami, Y., & Rawal, V. (2018). *Agricultural Tenancy in Contemporary India.* New Delhi: Society for Social and Economic Research.

Bhattacharya, S. (2019). Agricultural Tenancy in Contemporary Punjab: A Study Based on National Sample Survey Data. *Review of Agrarian Studies*.

Dhar, N. S., Pandey, M., & Kumar, A. (2022). Identifying socio-economic class in two villages of Bihar. *Review of Agrarian studies*.

Government of India (2022, 9 10). *https://pmkisan.nic.in/.* Retrieved 3 15, 2019, from https://pmkisan.nic.in/: https://pmkisan.nic.in/Documents/FAQPMKISAN.PDF

Government of Odisha. (2018, 12). *http://www.kalia.co.in/index1.html*. Retrieved 9 10, 2022, from http://www.kalia.co.in: http://www.kalia.co.in/FAQ.html

Government of Telengana (2018). *http://rythubandhu.telangana.gov.in/Default_RB1.aspx*. Retrieved 9 10, 2022, from http://rythubandhu.telangana.gov.in: http://rythubandhu.telangana.gov.in/Default_RB1.aspx#

Jodhka, S. S. (2018, June 30). Rural Change in time of distress. *Economic & Political Weekly*.

Murali, D., & Vijay, R. (2017, 08 05). Revival of Agriculture Sector and Increasing Tenancy in India. *Economic and Political Weekly*.

NSSO. (2013). *Key Indicators of Situation of Agricultural Households in India.* New Delhi: Ministry of Statistics and Planning Implimentation.

NSSO. (2021). *Situation Assesment of Agricultural Household and Land & holdings of household in rural India.* New Delhi: NSSO.

Ramachandran, V. K., & Rawal, V. (2009). The Impact of Liberalization and Globalization . *Global Labour Journal*.

Ramachandran, V. K., Rawal, V., & Swaminathan, M. (2010). *Socioeconomic Surveys of Three Villages of Andhra Pradesh: A Study of Agrarian Relations.* New Delhi: Tulika Books.

Ramakumar, R. (2010). CONTINUITY AND CHANGE: NOTES on Agriculture in New India. In A. D. Costa, *A New India? Critical reflection on long Twentieth Centuary* (pp. 43-70). Anthem Press.

Ramakumar, R. (2022). *Distress in field: Indian Agriculture after Economic Liberalisation* . Tulika books.

Reddy, U. S. (2022, October 21). *https://timesofindia.indiatimes.com/*. Retrieved from https://timesofindia: https://timesofindia.indiatimes.com/city/hyderabad/telangana-trs-banking-on-flagship-rythu-bandhu-to-power-victory/articleshow/94998824.cms

Roy, D. (2021, April 10). Farmer Suicide in India, 1997-2013. *Economic & Political Weekly*.

Roy, S. D. (2017, March 4). Economic Reforms and Agricultural Growth in India. *Economic & Political Weekly*, pp. 67-72.

Sajjad, H., & Chauhan, C. (2012). Agrarian distress and indebtedness in rural India: Emerging perspecitve and challenges ahead. *Journal of Geography and Regional Planning*, 397-409.

Shankar, R. (2022, October 21). *https://timesofindia.indiatimes.com/*. Retrieved from https://timesofindia: https://timesofindia.indiatimes.com/city/hyderabad/telangana-trs-banking-on-flagship-rythu-bandhu-to-power-victory/articleshow/94998824.cms

Sharma, A. N. (2005, 3 5-11). Agrarian Relations and Socio-Economic Change in Bihar . *Economic & Political Weekly*, pp. 960-972.

Singh, S. (n.d.). Arthiyas in Punjab's APMC Mandis.

Singh, S., & Bhogal, S. (2015, 11 7). Commission Agent System: Significance in Contemporary Agricultural Economy of Punjab. *Economic & Politically Weekly*, pp. 56-62.

The Hans India (2018, July 1). *https://www.thehansindia.com*. Retrieved Septmeber 20, 2022, from The Hans India: https://www.thehansindia.com/posts/index/Telangana/2018-07-01/Rythu-Bandhu-benefits-to-tenants-not-legal-KCR/394083

Capitalism and the Sea: The Maritime Factor in the Making of the Modern World
Liam Campling and Alejandro Colás,
Verso, London,
2021. pp. xiv + 418. Hardcover

Soumik Sarkar

Capitalism and the Sea: The Maritime Factor in the Making of the Modern World is an engrossing and meticulously researched book that challenges conventional wisdom about the role of the sea in the modern world — a rare intervention into the political economy, ecology, and geopolitics of the sea that shaped capitalism. The authors have studied the development of capitalism in the sea extensively, from the era of slavery and bonded labor to offshoring in the contemporary globalized world, with a focus on the temporal processes (circulation, exploitation, logistics) and spatial phenomena (order, appropriation, offshore). Over the years, the world ocean has served as a supply network, fish bank, and strategic space for the modern capitalist economy. The defining characteristics of capitalism as a mode of production seek to transcend the dichotomy of land and sea in a ceaseless pursuit of profit. The significance of the sea in the development of capitalism has received more and more attention since the 1990s. In 1995, the artist-historian Allan Sekula conducted an in-depth study of the marine economy and explored the various spatial networks upon which capitalism depends. He suggested that the cargo ship, not the Internet, is the technological center of current capitalist globalization. Peter Linebaugh and Marcus Rediker's *The Many-Headed Hydra* (2000) charts the emergence of capitalism in the English-speaking Atlantic as well as the history of resistance, by sailors, slaves, indentured servants, women workers, and peasants. Also, Rediker's *The Slave Ship* (2007) depicts the transatlantic slave trade from the viewpoints of its various participants, including merchants, captains and officers, sailors, slaves, and agitators. Buschmann (2004) argued that an 'aquacentric' conception of world history cannot only provide new conceptual frameworks for understanding contemporary history, but also address the spread of illnesses, imperial expansion, transoceanic women's movements, and international socialism, among others (Buschmann 2004, p.6).

Soumik Sarkar, Assistant Professor, Department of Economics, Adamas University, India. Email: soumik1289@gmail.com

Prior to the publication of *Capitalism and the Sea*, Liam Campling and Alejandro Colás published a paper in 2018 titled "Capitalism and the Sea: Sovereignty, Territory, and Appropriation in the Global Ocean" in which they introduced the concept of "terraqueous territoriality" which analyses the relationship between capitalism as a social formation and sea as natural force (Campling and Colás 2018). This research into the contradictions inherent in capitalism's attempt to transcend the land-sea divide has been fully developed in the present book as an investigation into capitalism's maritime origins and development.

The authors begin by arguing that "global capitalism is a seaborn phenomenon" (p. 1), that perpetuates the legacy of seaborne slavery and bondage by drilling seabed and coastlines in an endless pursuit of profit, thus transcending the land-sea divide for the accumulation of surplus-value. The introductory chapter delves into capitalism's complex relationship with the sea (including the high seas, which cannot be permanently occupied in the same way that land can), highlighting the various contexts in which capitalism interacts with the sea. The analysis is built on a Marxian historical materialist framework that views capitalism as a mode of production. In this review, I will set aside my minor disagreements to focus exclusively on the author's insights, which I believe are significant enough to warrant an exclusive focus.

The authors' emphasis on the sea allows the reader to gain a new perspective on capitalism, increasing awareness of contemporary issues and possible solutions and highlighting new connections. Chapter 1 on "Circulation" elaborates on the various ways in which capitalism has been shaped by the natural geographical properties of the sea, which have shaped the socio-economic and political relationships on land. While focusing on mercantilist activities at sea, the authors did not overlook the connection between production relations and circulation processes, emphasizing class formation in the production and transportation of ships required for trade or armed combat, while also evaluating the role of trading companies such as the Dutch East India Company (VOC) and the English East India Company (EIC). The conclusion of this chapter is particularly noteworthy from a methodological standpoint. Here the authors discuss their concept of capitalism, which they define as a set of "historically specific social relations" (p. 54) as well as the theoretical implications of their analysis for understanding the various forms of capitalism, touching on the debate over capitalism's genesis between "circulationists" (Braudel, Wallerstein) and "political Marxists" (Brenner, Woods). Notably, the authors attempted to situate the realm of distribution (and consumption) in its constitutive relation with that of production. As Marx himself pointed out, "production, distribution, exchange and consumption are identical, but that they all form the members of a totality, distinctions within a unity…distribution as distribution of products; while

as distribution of the agents of production it is itself a moment of production… Mutual interaction takes place between the different moments. This the case with every organic whole" (Marx, 1993: 99-100). While emphasizing this interconnection between circulation and production in capitalist development, authors felt that capitalist social relations were "born in the countryside but nurtured through international trade…subsequently latching onto pre-existing money and commercial circuits of capital" (p. 60).

Chapter 2 examines the military-judicial "Order", evaluating the legal regulations that governed maritime space and have shaped capitalism's development over the last 500 years. Chapter 3 then turns to the critical issue of "Exploitation" focusing on seafarers and fishing crew. The authors define exploitation in this context as "production of surplus value in the movement of commodity capital around the world (e.g., the merchant navy) and in the appropriation of nature at sea (e.g., fishing)" (p. 110). However, while using exploitation in the Marxist sense of extraction of unpaid surplus labor, the authors have placed a greater emphasis on the antagonism between groups of people (asset-owning class and laboring class following the traditional Marxist framework) than on the specific processes of performance and appropriation at sea. Campling and Colás resorted to a maritime labor regime analysis to understand the different forms of capitalist exploitation and the evolution of new forms of disciplining the international workforce.

Chapter 4 on "Appropriation" discusses the commodification of nature, including the industrialization of fish. As with land, capitalism has resulted in the "enclosure of commons, dispossession of direct producers" at sea, and commodification of nature, turning the use-value into exchange values for profit. When discussing property rights in the sea and the commoditization of fish, the authors invoked Jason Moore's concept of "ecological surplus", which emphasized the issue of labor exploitation via capitalist appropriation of "nature's life making capacities" (Moore, 2015: 13). From here, the authors move to "Logistics" in Chapter 5. They examined how maritime logistics has evolved as a critical component of capitalist planning for increasing capital accumulation through low transportation costs, with a detailed discussion of the capitalist maritime technologies from the era of colonial conquest to current neoliberal globalization. Finally, Chapter 6 sheds light on offshoring, which not only connects and facilitates global interactions but has emerged as a "realm of exceptional freedom and experimentation", especially in ensuring concentration of wealth, disposal of unwanted waste, and deepening capitalist exploitation (p. 269). The concluding section, appropriately titled "Terraqueous Horizons" discuss the key lessons learned from the analysis, debunking the liberal myth of progress and development through maritime

technologies highlighting the sphere of exploitation and injustice, conquest, brutality, and environmental degradation.

In a recent article, Duara (2021) argued that while the conquest of nature as the means of achieving human satisfaction is the driving force of modern historiography, the study of nature has not been connected with the narrative of the nation's struggles and achievements. It is thus essential to view historical events in terms of natural phenomena, such as oceanic circulations of water (Duara 2021). In this book, the authors emphasize the importance of addressing anti-capitalist politics through a comprehensive understanding of capitalism's relationship with the sea, by examining the constitutive effects of various socio-economic, political, and natural processes on the evolution of capitalism in the sea, while also celebrating the promise of labor internationalism fostered by seaborne movements and leveraging the potential of innovation, political imagination, and social solidarity. A distinguishing feature of this book is the breadth and focus of the topics discussed in each chapter. The authors bring up issues that are uncommon in a single contemporary book on the subject. It examines the history and development of capitalism at sea and the interaction of numerous factors that shaped maritime technologies. As insightful as it is, particularly in light of the multi-dimensional approach it takes to capitalism and the devastation it causes in the contemporary global society, *Capitalism and the Sea* is a must-read for research scholars, social activists, and general readers seeking an understanding of the prospects and problems of capitalism in the sea, as well as its role in shaping the society in which we live today.

Reference

Buschmann, Rainer F. 2004. "Oceans of World History: Delineating Aquacentric Notions in the Global Past 1." *History Compass* 2 (1): 1-10.

Campling, Liam, and Alejandro Colás. 2018. "Capitalism and the sea: sovereignty, territory and appropriation in the global ocean." *Environment and Planning D: Society and Space* 36, (4): 776-794.

Duara, Prasenjit. 2021. "Oceans as the Paradigm of History." *Theory, Culture & Society* 38(7–8): 143–66.

Gilroy, Paul. 1993. *The Black Atlantic: Modernity and Double-Consciousness.* London: Verso.

Linebaugh, Peter, and Marcus Rediker. 2000. *The Many-headed Hydra: Sailors, Slaves, Commoners, and the Hidden History of the Revolutionary Atlantic.* London: Verso.

Marx, Karl. 1993. *Grundrisse. Foundations of the Critique of Political Economy*, London: Penguin.

Moore, Jason W. 2015. "Nature in the limits to capital (and vice versa)." *Radical Philosophy* (193): 9-19.

Rediker, Marcus. 2007. *The Slave Ship: A Human History.* London: Penguin.

Resnick, Stephen, and Richard Wolff. 2013. "Marxism." *Rethinking Marxism* 25 (2): 152-162

Instructions for Authors

Before submitting the manuscript, authors are requested to read the aims and scope of the journal, instructions for submission and ethics in publishing. Papers not prepared accordingly may be turned down or would be asked to resubmit.

Organizing the Paper

File one
1. Title of the Paper: Title of paper should be limited within 14 words
2. Author(s) Name(s) and Institutional Affiliation(s) with Email id(s)
3. An Abstract within 250 words
4. Up to six Keywords with JEL Classification

File Two
1. Title of the Paper
2. Introduction
3. Review of Literature and Research Gap
4. Objectives
5. Methodology and Data
6. Analysis and Findings
7. Summary and Conclusions
8. References

Length of the paper: Maximum 8000 words including tables, references and notes
Font: Times New Roman font size 12.
Line Spacing: Double spacing

Referencing Style (in perusal of the APA Format)

Journal Article
Patnaik, P. (1998). Amartya Sen and the theory of public action. Economic and Political Weekly, 33(45), 2855-2859.

Book Chapter
Benito, G., & Gripsrud, G. (1995).The internationalization process approach to the location of foreign direct investment: An empirical analysis.In R. B. McNaughton, &M. B. Green (Eds.), The Location of Foreign Direct Investment: Geographic and Business Approaches (pp. 43-58). Aldershot: Avebury Press.

Book
Levien, M. (2018). Dispossession without development: Land grabs in neoliberal India. New York: Oxford University Press.

Website
Rao, M. G. (2017).Central transfers to states in India: Rewarding performance while ensuring equity. Report prepared for the NITI Aayog. Retrieved from https://niti.gov.in/writereaddata/files/document_publication/Final%20Report_25Sept_2017.pdf(Date of last access Month Date Year)

Beck, T. (2015). Microfinance: A critical literature survey. (World Bank Independent Evaluation Group Working Paper No. 4). Retrieved from https://openknowledge.worldbank.org/handle/10986/23546 (Date of last access Month Date Year)

Submission Checklist

Ensure the following before submitting the manuscript:

- Full name(s) of author(s) with e-mail ids, mobile/phone numbers and full postal address(es)
- For multi-authored manuscript, designate one as the Corresponding Author
- Include an Abstract (200-250 words) and Keywords (up to 6)
- All tables, figures, maps, appendices, etc. referred to in the text must have numbers, titles and sources; add notes and units wherever relevant
- Ensure only those references cited in the text are present in the 'References' list and these must be complete in all respects; for online sources, complete URL and date of last access must be mentioned
- Check for grammar and spellings
- Obtain prior permission for use of any copyrighted material from other sources (including the Internet)
- Mention any conflict of interests (or, its absence) involving the manuscript

All correspondence must be addressed to editoroeja@gmail.com