

COVID-19 and Dynamics of Food Insecurity in Eastern India: Evidence from Analysis of a Panel Survey

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ABSTRACT

The COVID-19 pandemic-induced lockdowns raised concerns about increased food insecurity globally. This paper examines the incidence of food insecurity during the first and second wave of the COVID-19 pandemic in the poorest region of India. The study used panel data from two rounds of a telephone survey of 2,091 rural households. The study found that the incidence of food insecurity increased throughout the pandemic, with about 79 per cent of rural households reporting food insecurity in the second round of the survey, up from 70 per cent in the first round. About 59 per cent of the rural families who were food secure during the first round became food insecure by the second round of the survey. Our findings indicate that food insecurity due to COVID-19 is more likely to be structural than transitory.

Keywords: COVID-19, food insecurity, panel analysis, eastern India

JEL Codes: D10, I31

I

INTRODUCTION

The devastating blow of the COVID-19 pandemic has undeniably regressed global efforts to eradicate hunger and poverty. Globally, governments had to adopt stringent movement restrictions to control the virus spread, which was necessary but instigated a severe economic downturn (Kanitkar, 2020; Reardon *et al.*, 2007; Tripathi *et al.*, 2021). The lockdown enforcement and movement restrictions caused widespread job losses and a decline in income, particularly impacting those in the informal sector or self-employment (Ayo-Lawal *et al.*, 2022; Birner *et al.*, 2021; Onyango *et al.*, 2021). Such a sharp decline in income could entrench long-term poverty and food insecurity, potentially inflating social and health burdens and hindering human resource development (Abdullah *et al.*, 2021; Béné *et al.*, 2021; Dasgupta and Robinson, 2021; Rivera-Ferre *et al.*, 2021, McAuliffe *et al.*, 1997; Priyadarshini and Abhilash, 2021). Moreover, the economic repercussions of the pandemic present a significant barrier to achieving the Sustainable Development Goals (SDGs), particularly those on poverty alleviation and food insecurity (Belik, 2020; Adhikari *et al.*, 2021; Bukari *et al.*, 2022).

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India recorded the second-highest number of COVID-19 cases and the third-highest number of deaths globally (WHO, 2022). The impact of the pandemic, while widespread, has not been uniform, with the effect on poverty and food insecurity being disproportionately large in India's eastern region (Dodd *et al.*, 2021; Kumar *et al.*, 2022). The area's limited access to financial resources and a workforce primarily engaged in informal or agricultural sectors paints a dire picture (Dar *et al.*, 2022; Kumar *et al.*, 2015, 2020b). The time required to reverse the economic shocks, such as the 2008 recession, suggests that food insecurity arising from the pandemic may have long-lasting effects. This situation necessitates an assessment to determine whether current food insecurity is a transient phase or a symptom of deeper, structural issues, which would require a reassessment of policies (Hirvonen *et al.*, 2021; Agamile, 2022; Ayo-Lawal *et al.*, 2022). Furthermore, the pandemic's effects are heterogeneous and regressive, hitting poorer nations and households harder. In India, the eastern region, marked by the highest rates of poverty and malnutrition, suffered more significant income loss than other areas. However, the empirical understanding of the dynamics and determinants of pandemic-induced food insecurity remains limited.

This study aims to quantify the extent of food insecurity and explore its determinants during the COVID-19 pandemic, focusing on rural households across five eastern states of India—Bihar, eastern Uttar Pradesh, Jharkhand, Odisha, and West Bengal. By analysing detailed panel data from 2,091 rural households, the research intends to provide a comprehensive understanding of the welfare losses incurred due to the pandemic and the efficacy of governmental interventions in securing food for vulnerable households. The insights from this study can help in furthering the development of targeted policies to mitigate the economic impacts of the pandemic (Kerr and Thornton, 2020; Valensisi, 2020; Ahmed *et al.*, 2021).

Moreover, this paper contributes to the burgeoning body of literature on the ramifications of pandemic-induced economic disruptions, with many studies examining labour market outcomes in high-income countries (Adams-Prassl *et al.*, 2020; Alon *et al.*, 2020; Barrero *et al.*, 2021; Bartik *et al.*, 2020; Bui *et al.*, 2020; Chetty *et al.*, 2020; Coibion *et al.*, 2020; Cowan, 2020) and low- to middle-income countries, including ours. While most studies have conducted statistical analyses, projecting long-term effects from a one-time cross-sectional data analysis, our study uses actual data over time to assess changes in food insecurity associated with pandemic-induced disruptions, thus providing a dynamic perspective (Ahmed *et al.*, 2021; Adjognon *et al.*, 2021). Through panel data, our research distinguishes itself by examining changes in food insecurity and identifying vulnerable households in a part of India that has yet to receive such focused attention.

II

CONCEPTUAL FRAMEWORK

Food security is multifaceted and structured on four essential pillars: availability, access, utilisation, and stability (Smith, Rabbitt, Coleman-Jensen, 2017). The

onslaught of COVID-19 has compromised these pillars, directly affecting the entire spectrum of food security (Devereux, Béné and Hoddinott, 2020; Houessou, Cassee, Sonneveld, 2021; Okolie and Ogundeji, 2022; Vatta 2024). Tracing the pandemic's specific impacts on food (in)security presents a complex puzzle, but it is possible to navigate the various channels through which COVID-19 has influenced this critical issue.

Supply-side disruptions, both spatial and temporal, have limited food availability, a result of logistical challenges and labour shortages precipitated by reverse migration and difficulties in accessing input markets (Godrich et al., 2022; Kent et al., 2022; Singh et al., 2021; Houessou *et al.*, 2021; Kansime et al., 2021; Kumar et al., 2022; Pu and Zhong, 2020; Workie *et al.*, 2020). However, agriculture in India, spared from lockdown impositions, did not foresee such supply-side constraints, recording positive growth even during the pandemic (Varshney *et al.*, 2021) and recorded an increase in both exports and export revenue (Kumar, 2021). Nonetheless, the closure of schools, impacting the world's largest school feeding programme, disrupted food routines for children (Alvi and Gupta, 2020).

The physical and economic access to food was equally impacted by the pandemic, primarily through the economic downturn caused by movement restrictions leading to job and income losses. This effect was pronounced in eastern India, where many are employed in the informal or gig economy sectors, which offer limited remote work opportunities (Kumar *et al.*, 2020a; Kumar, Sonkar, Aditya, 2022). The agriculture sector also witnessed income reduction due to widened price spreads between producer and consumer prices, resulting from anticipated lower demand and heightened supply chain transaction costs (Abdullah, Mersat, Wong, 2021; Bairagi, Mishra, Mottaleb, 2022; Bundervoet, Dávalos, Garcia, 2022; Narayanan, Saha, 2020; Kumar *et al.*, 2023; Workie et al., 2020). These factors have eroded purchasing power, causing an increase in food insecurity.

Stability, a reflection of sustained food availability and access, has been unsettled by the uncertainty surrounding the pandemic's trajectory. Amartya Sen's food entitlement approach sheds light on different legal means of acquiring food: production, labor, trade, and transfers (Devereux, Béné and Hoddinott, 2020). The pandemic's impact is harsher on households reliant on labor-based entitlements due to job losses and transfer-based entitlements, particularly in migrant-heavy eastern India (Kumar, Sonkar, Aditya, 2022). Lockdowns have profoundly impacted migrant laborers, often forcing them to traverse great distances to return home, becoming emblematic of the pandemic's strain on the population.

In essence, COVID-19 is anticipated to increase food insecurity, yet quantifying this impact remains challenging. This study seeks to identify households experiencing increased food insecurity due to the pandemic. We hypothesise that households with pre-existing vulnerabilities—poverty, low education, limited access to resources, and social capital—are more susceptible to the pandemic's effect on increasing food insecurity.

III

DATA AND SURVEY METHODOLOGY

Our study leverages data from two rounds of telephone surveys spanning five eastern states of India: Bihar, eastern Uttar Pradesh, Jharkhand, Odisha, and West Bengal. The timing of the surveys was deliberate, with the first coinciding with the onset of the first COVID-19 wave in April-May 2020 and the second round aligning with the second wave from December 2020 to January 2021.

The sampling framework for the survey was informed by an IFPRI survey from 2018/2019. Originally, the sample size included 4,082 households, chosen through stratified random sampling proportional to each state's rural populace. The selection process involved a hierarchy of random choices: 10 districts in Bihar, 4 in Jharkhand and Odisha, and 8 in eastern UP and West Bengal, from which two blocks per district, two villages per block, and 30 households per village were chosen. However, for various reasons, including non-availability and change of contact details, the sample size narrowed to 2,599 households for the first round and 2,091 for the second. The attrition, which is common in the case of panel surveys, more so in telephonic data collection, could result in bias, and the results should be interpreted with caution. Table 1 provides summary statistics for both rounds. However, we focus on the second round of data for discussion in this study.

The composition of the surveyed sample was diverse, with 642 households in Bihar (30.7 per cent), 420 in eastern UP (20.1 per cent), 228 in Jharkhand (10.9 per cent), 345 in Odisha (16.5 per cent), and 456 in West Bengal (21.8 per cent) (Table 1). The study aimed to assess various aspects: food insecurity status, agricultural operations, access to markets, and the effectiveness of government assistance such as the Pradhan Mantri Garib Kalyan Yojana (PMGKY) and other relief packages in response to COVID-19.

Key demographic variables revealed that the average age of a household head was 49 years, with the majority being male (96 per cent) and approximately 70 per cent literate—a figure slightly above the national rural literacy rate of 67 per cent (Census of India, 2011). Education levels varied, with 15.5 per cent attaining up to intermediate education and 5 per cent holding a college degree. The average household had about six years of schooling. Social composition was also varied, with 23 per cent from the General category, 45 per cent from Other Backward Classes, and 32 per cent from Scheduled Castes or Tribes.

Most rural households (73 per cent) were involved in farming, with an average landholding of 0.64 ha. The farming community included 54 per cent marginal, 13 per cent small, and nearly 7 per cent medium and large farmers. Primary occupations differed, with 61 per cent in agricultural activities, 3.6 per cent as farm wage labourers, 19 per cent in non-farm labour, and 7 per cent in trade or business. Non-farm activities contributed to roughly 45 per cent of household income. Migration affected nearly 28

per cent of households, and 71 per cent received PMGKY benefits. During the lockdown, a substantial 75 per cent reported a significant drop in income or wages.

TABLE 1. SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

Variable (1)	Round 1		Round 2	
	Mean (2)	Std. Dev. (3)	Mean (4)	Std. Dev. (5)
Age (years)	49.46	12.54	49.48	12.39
Male-headed households	96.38	18.69	96.21	19.09
Household size (number of members)	5.81	3.04	5.8	3.02
<i>Education of household head (per cent)</i>				
Illiterate	30.88	46.21	29.51	45.62
Primary school	31.77	46.57	31.9	46.62
High school	17.44	37.96	17.74	38.21
Intermediate	14.71	35.43	15.49	36.19
Graduation and above	5.2	22.2	5.36	22.52
Education of household head (in years)	5.89	4.91	6.06	4.92
<i>Social group of the household head (per cent)</i>				
Scheduled Castes (SC)	23.79	42.59	24.07	42.76
Scheduled Tribes (ST)	7.27	25.98	7.51	26.36
Other Backward Classes (OBC)	44.42	49.7	45.17	49.78
General Category (GC)	24.52	43.03	23.25	42.25
<i>Land category (percent)</i>				
Landless	26.78	44.29	27.16	44.49
Marginal	54.02	49.85	53.61	49.88
Small	12.7	33.3	12.72	33.33
Medium and large	6.5	24.66	6.5	24.67
Operational land holding (hectares)	0.87	1.04	0.64	0.98
<i>Occupation of households (per cent)</i>				
Agriculture and allied	60.52	48.88	61.02	48.78
Farm wage labour	3.84	19.23	3.63	18.72
Non-farm wage labour	18.85	39.12	18.65	38.96
Trade and business	7.04	25.58	6.98	25.49
Government and private	5.19	25.58	5.26	22.33
Others	5.19	22.19	4.45	20.62
Share of income from non-farm (per cent)	44.73	27.8	44.92	27.8
Number of migrated members of household (per cent)	29.78	45.73	28.41	45.11
Beneficiary of PMGKY (Yes = 1)	70.3	45.7	71.4	45.2
<i>Reduced income/wages during lockdown (per cent)</i>				
Significantly reduced	73.72	44.02	74.89	43.37
Somewhat reduced	24.24	42.86	23.29	42.28
Not reduced at all	2.04	14.14	1.82	13.36
Observations	2599		2091	

Source: IFPRI-ICAR telephone surveys in eastern India, 2020/2021.

Note: PMGKY = Pradhan Mantri Garib Kalyan Yojana.

IV

STATUS OF FOOD INSECURITY IN EASTERN INDIA

The investigation into food insecurity among rural households in eastern India has presented critical insights into the prevalence and dynamics of this essential aspect of rural livelihoods. The two rounds of surveys have provided a comparative perspective, shedding light on the shifts in food security over time. The data revealed

a worrying decline in food security, with the proportion of food-secure rural households dropping from 29.3 per cent in the first round to just 21 per cent in the second round.

These findings are not uniform; significant variations were observed across states. Initially, food security levels spanned from a mere 3.5 per cent to a substantial 43.5 per cent. However, by the second round, these percentages had tightened to 14.8 per cent to 23 per cent. Odisha was noted for having the lowest rate of food-secure rural households in both rounds (or the highest proportion of food-insecure households), although it saw a marginal increase in the second round. Jharkhand stood out for having the lowest percentage of food-insecure rural households in the first round but experienced a significant decline by the second round (Table 2).

TABLE 2. STATUS OF FOOD INSECURITY IN EASTERN INDIA

States (1)	Incidence of food insecurity (per cent)	
	Round 1 (2)	Round 2 (3)
Bihar	62.9	78.0
Eastern UP	66.7	77.6
Jharkhand	56.6	79.4
Odisha	96.5	85.2
West Bengal	72.8	77.0
Total	70.7	79.1

Source: IFPRI-ICAR telephone surveys in eastern India, 2020-21.

This fluctuation in food insecurity status aligns with variations across key socioeconomic characteristics. The surveys noted that households from the General caste category were less likely to be food insecure compared to those from lower social strata, such as Scheduled Castes (SCs) and Scheduled Tribes (STs). Moreover, landless farmers were understandably more vulnerable to food insecurity. Migrant households also fared worse regarding food security than non-migrant households in both rounds.

The Food and Agriculture Organization's Food Insecurity Experience Scale (FIES) was the benchmark for assessing food security status, utilizing eight standard questions with binary responses (Yes/No). A "No" to all questions indicated food security, while varying numbers of "Yes" responses categorised households into "mildly," "moderately," or "severely" food insecure.

Most rural households were classified as mildly food insecure in both survey rounds. Notably, moderate food insecurity rose from 18 per cent in the first round to 25 per cent in the second round. Severe food insecurity also saw an uptick, albeit smaller, from 0.9 per cent to 1.6 per cent. The second round saw an increase to approximately 60 per cent in mildly food insecure households, a significant rise from 45 per cent in the first round. This worsening trend was particularly pronounced among SC, ST, and Other Backward Classes (OBC) households. While no medium and large farmers were found to be severely food insecure in either round, landless and migrant households reported greater severity in food insecurity in the second round. Migrant

households, in particular, saw an increase to about 3 per cent being severely food insecure (Table 3).

TABLE 3. STATUS OF FOOD INSECURITY ACROSS VARIOUS CATEGORIES OF HOUSEHOLDS ACROSS BOTH TELEPHONE SURVEY ROUNDS

Variable (1)	Food Secure		Mildly food insecure		Moderately food insecure		Severely food insecure	
	Round 1 (2)	Round 2 (3)	Round 1 (4)	Round 2 (5)	Round 1 (6)	Round 2 (7)	Round 1 (8)	Round 2 (9)
	Social group							
SC and ST	19.1	16.5	44.9	56.8	35.2	24.7	0.9	2.0
OBC	31.3	19.1	44.1	61.7	23.4	17.3	1.3	2.0
General	39.5	30.7	46.3	59.9	14.0	9.3	0.2	0.2
	Farming group							
Landless	22.9	18.0	41.0	54.2	34.3	24.7	1.8	3.2
Marginal	29.0	19.5	47.9	64.7	22.4	14.5	0.7	1.3
Small	35.0	24.1	41.0	54.5	23.7	21.1	0.4	0.4
Medium and large	47.8	39.0	42.7	52.2	9.6	8.8	0.0	0.0
	Occupation							
Agriculture and allied	29.2	22.1	42.6	54.7	27.8	22.2	0.4	1.0
Farm wage labor	23.7	10.5	51.3	68.4	18.4	18.4	6.6	2.6
Non-farm wage labor	27.4	14.4	45.9	73.1	25.1	11.0	1.5	1.5
Trade and business	30.8	24.0	53.4	65.8	15.1	4.8	0.7	5.5
Government and private	37.3	38.2	45.5	48.2	15.5	10.0	1.8	3.6
Other	31.3	12.5	34.4	62.5	34.4	25.0	0.0	0.0
	Education							
No schooling	26.9	13.6	45.7	68.2	25.9	15.7	1.5	2.4
Primary	28.8	21.9	47.2	61.9	23.2	15.0	0.8	1.2
High school	32.9	25.3	46.6	59.0	19.7	14.3	0.8	1.4
Intermediate	25.3	22.5	35.8	42.0	38.3	34.6	0.6	0.9
Graduation	41.4	33.3	50.6	58.6	8.1	5.8	0.0	2.3
Post-graduation	60.0	48.0	28.0	36.0	12.0	16.0	0.0	0.0
	Migrant vs. non-migrant							
Migrant	28.3	17.0	50.3	69.4	20.9	10.9	0.5	2.7
Non-migrant	29.7	22.5	42.6	55.9	26.6	20.4	1.1	1.1
Total	29.3	21.0	44.8	59.7	24.9	17.8	0.9	1.6

Source: IFPRI-ICAR telephone surveys in eastern India, 2020/2021.

Note: SC = Scheduled Caste; ST = Scheduled Tribe; OBC = Other Backward Classes.

Temporal changes in food insecurity were also analysed. It was found that of the 29 per cent of food-secure rural households in the first round, a substantial 59 per cent became food insecure in the second round. Conversely, of the 71 per cent of food-insecure households in the first round, only 12.9 per cent transitioned to food security in the second round, while the vast majority remained food insecure (Table 4).

TABLE 4. TRANSITION IN STATUS OF FOOD INSECURITY IN RURAL HOUSEHOLDS OF EASTERN INDIA

Incidence of food insecurity in Round 1 (1)	Incidence of food insecurity in Round 2		Total (4)
	Food secure (2)	Food insecure (3)	
Food secure	248 (40.5)	365 (59.5)	613 (29.3)
Food insecure	190 (12.9)	1,288 (87.1)	1,478 (70.7)
Total	438 (21.0)	1,653 (79.0)	2,091 (100.0)

Source: IFPRI-ICAR telephone surveys in eastern India, 2020/2021.

Note: These figures refer to the number of households; figures in parentheses are percentages.

These shifts in food insecurity were further detailed in terms of the severity of food insecurity. Among previously food-secure households, 40.5 per cent remained secure by the second round. However, 53.5 per cent descended into mild food insecurity, 5.1 per cent into moderate, and 1 per cent became severely food insecure. In contrast, among the initially severely food-insecure households, 15.8 per cent achieved food security by the second round, while the rest moved into less severe categories or remained in severe food insecurity (Table 5).

TABLE 5. TRANSITION IN EXTENT OF FOOD INSECURITY RURAL EASTERN INDIA

Status of food insecurity at Round 1	Status of food insecurity at Round 2			
	Mildly food insecure	Moderately food insecure	Severely food insecure	
Food secure	40.5	53.5	5.1	1.0
Mildly food insecure	17.3	72.8	8.2	1.7
Moderately food insecure	4.8	43.1	50.2	1.9
Severe food insecure	15.8	73.7	5.3	5.3
	21.0	59.7	17.7	1.6

Source: IFPRI-ICAR telephone surveys in eastern India, 2020/2021.

This research thus underscores the precarious nature of food insecurity in rural eastern India and the need for targeted interventions that consider the socio-economic dynamics within these communities.

V

RESULTS AND DISCUSSION

Table 6 exhibits the parameter estimates of food insecurity correlates in eastern India's rural households. Since we have collected data from the same households on two occasions over a period of time and since the dependent variable is a count variable, a Poisson random fixed-effects model was used to estimate the empirical model¹. We also employed block fixed effects to control unobserved household characteristics influencing block-level food insecurity. The association between food insecurity and the age of household heads is negative and significant; that is, rural households with older household heads were more likely to be food secure than those with younger heads. Younger and less-experienced rural household heads were more likely to lose their jobs and thus have less income to buy food and other items, and they were more likely to be food insecure. Sonkar, Bathla and Kumar (2022) found that rural households with lower average age are 7 per cent more likely to experience food insecurity than those with older HHs.

The Poisson random fixed-effects regression estimates in Table 6 show that rural households with fewer members were more likely to be food insecure than those with more members, the reason being that larger families often have more income earning members and resources to cope with a situation such as the pandemic than smaller families. There is a negative association between food insecurity and the number of years of education of household heads, a finding which is significant at a one per cent

TABLE 6. DETERMINANTS OF FOOD INSECURITY AND TRANSITION IN STATUS OF FOOD INSECURITY

Variable	Food insecurity Dependent variable: Food Insecurity Experience Scale [FIES])		Transition in status of food insecurity	
	OLS	Poisson	Food insecure in Round 1 to food secure in Round 2	Food secure Round 1 to food insecure Round 2
	Coefficient	Coefficient	Coefficient	Coefficient
Age of household head (HH) (in years) (in log)	-0.185** (0.087)	-0.071** (0.031)	0.044* (0.025)	0.014 (0.032)
Family size (in numbers) (in log)	-0.047*** (0.016)	-0.019*** (0.006)	-0.003 (0.015)	0.042** (0.019)
Education of HH (in years) (in log)	-0.315*** (0.046)	-0.119*** (0.003)	0.027 (0.021)	0.009 (0.027)
Operational landholding (in hectares) (in log)	-1.395*** (0.064)	-0.597*** (0.014)	0.014 (0.086)	0.025 (0.113)
<i>Social group: Base-SC and ST</i>				
Other Backward Classes (1 = Yes)	-0.026 (0.032)	-0.006* (0.003)	-0.007 (0.015)	0.026 (0.020)
General category (1=Yes)	-0.348*** (0.011)	-0.151*** (0.003)	-0.024 (0.019)	-0.013 (0.025)
<i>Occupation: Base-others</i>				
Agriculture and allied	-0.038* (0.022)	-0.016*** (0.005)	0.053* (0.029)	0.038 (0.038)
Farm wage labor	0.125*** (0.027)	0.044*** (0.016)	0.049 (0.041)	0.049 (0.053)
Non-farm wage labor	0.104 (0.070)	0.043*** (0.014)	0.051* (0.031)	0.065 (0.041)
Trade and business	0.162 (0.297)	0.060 (0.081)	0.055 (0.035)	0.000 (0.046)
Private employees	0.165*** (0.028)	0.060*** (0.009)	0.147*** (0.037)	0.034 (0.049)
Work as a migrant (1 = Yes)	0.067*** (0.000)	0.022*** (0.002)	0.004 (0.014)	-0.027 (0.018)
Has Kisan Credit Card (1 = Yes)	-0.076 (0.210)	-0.035 (0.063)	0.024 (0.017)	-0.001 (0.022)
<i>Awareness of government schemes</i>				
Direct cash transfer (1 = Yes)	-0.104*** (0.010)	-0.034*** (0.006)	-0.001 (0.013)	0.018 (0.018)
Work under MGNREGA scheme	0.134*** (0.007)	0.053*** (0.010)	-0.055*** (0.015)	-0.000 (0.020)
Opened bank account under Jan Dhan Yojana (1 = Yes)	-0.084*** (0.019)	-0.029*** (0.006)	0.005 (0.012)	0.023 (0.016)
Growing cash crops (1 = Yes)	-0.130 (0.105)	-0.047** (0.022)	-0.000 (0.013)	0.001 (0.018)
Have cattle/buffalo (1 = Yes)	-0.139*** (0.024)	-0.051*** (0.010)	0.024* (0.013)	0.009 (0.017)
HHs income reduced (1 = Yes)	0.218 (0.364)	0.100 (0.104)	0.025 (0.015)	-0.004 (0.020)
Member of a political party (1 = Yes)	0.012 (0.026)	0.002 (0.006)	-0.000 (0.019)	0.012 (0.025)
Share of non-farm income (in log)	-0.017 (0.022)	-0.005 (0.006)	-0.002 (0.004)	-0.004 (0.006)
ln alpha		-4.669		

(Contd.)

TABLE 6 (CONCLD.).

		(73.837)		
Constant	7.655***	3.010***	-0.198	-0.079
	(0.030)	(0.085)	(0.222)	(0.292)
Block fixed effects	Yes	Yes	Yes	Yes
Observations	2089	2089	2,089	2,089
Number of years	2	2		
R-squared			0.273	0.278

Source: Authors' estimates based on data from IFPRI–ICAR telephone surveys in eastern India, 2020/2021

Note: 1. SC = Scheduled Caste; ST = Scheduled Tribe; MGNREGA = Mahatma Gandhi National Rural Employment Guarantee Act; *, **, and *** indicate statistical significance at the $p < 0.1$, $p < 0.05$, and $p < 0.01$ levels; figures in parentheses are standard errors. 2. Summary statistics of the variables used in the model provided in Appendix 1.

level. This implies that rural HHs with fewer years of education were more likely to be food insecure. More years of schooling suggest that households have better knowledge and skills for getting jobs in industries and thus have access to better earnings (Valletta 2015). Such families have better options for dealing with sudden food price shocks during events like the COVID-19 pandemic. Our result is consistent with Mebratu (2018), Ziliak (2021), Bashir et al. (2012), and Smith, Rabbitt, and Coleman-Jensen (2017), who reported that fewer years of education among household members leads to greater food insecurity.

The association between operational landholding and food insecurity is also negative and significant at a one per cent level of significance. This implies that rural households with small operational landholdings are more likely to be food insecure. One probable reason is their limited access to agricultural input and output markets. Thus, the shutdown of transport facilities due to lockdown led to lower income. Our result is consistent with Agidew and Singh (2018), who reported that the smaller farmers (those with operational landholdings of less than 1 hectare) are more food insecure. Rural households in our sample in the OBC and General caste categories were more likely to be food secure than lower caste rural households (SCs and STs). This result aligns with Ziliak (2021), who reported that families belonging to upper caste categories were likely to be more food secure because they had more resources to cope with events like the COVID-19 pandemic.

All sectors except the agricultural and allied sectors were severely affected during the pandemic, recording negative growth. This was due to the complete shutdowns by the government to curb the spread of the virus (RBI Report 2020-21). Our regression results also indicate that rural households engaged in agriculture and allied activities were less likely to be food insecure. Rural households whose members worked as labourers on and off farms were more likely to be food insecure. During the lockdown, the government banned gatherings of people and imposed restrictions on movement; this led to unemployment, income loss, and fewer resources and money to manage the pandemic. Research shows that those employed in the gig economy or informal sector were more likely to report job loss or reduction in income (see Umar, Xu, Mirza 2021; Shekar and Mansoor 2021; Gururaja and Ranjitha 2022). Rural households whose members worked in private companies and industries were more

likely to be food insecure, again for the main reason being the shutdown of these companies/industries during the strict lockdowns. Rural households whose members migrated were more likely to be food insecure. In rural regions, most families migrate to other places to get jobs and better livelihoods due to a lack of employment at home. Such households were most affected during the lockdown because of industry closure; unemployment meant less income to buy daily necessities and, therefore, a greater likelihood of food insecurity (Sonkar, Bathla and Kumar, 2022).

During COVID-19 lockdowns, the Government of India announced several flagship programmes that included social assistance packages and free food grains to provide immediate relief to vulnerable and poor households. Under the PMGKY, 204 million women received cash transfers in three monthly instalments of INR 500 each; these were distributed to holders of bank accounts that were opened under the Jan Dhan Yojana scheme in April, May, and June of 2020. The programme was subsequently extended for three months. The results in Table 6 indicate that rural households aware of government schemes such as direct cash transfers and those who opened a bank account under the Pradhan Mantri Jan Dhan Yojana were less likely to be food insecure.

In the rural regions of India, most households have cattle/buffalo and depend on them for regular cash flow, selling milk through informal channels. Table 6 shows that rural families with cattle/buffalo were less likely to be food insecure; rural households cultivating cash crops such as sugarcane, cotton, jute, and oilseeds were less likely to be food insecure. We assessed the determinants of rural families who were food insecure in Round 1 but had become food secure by Round 2 and families who were food secure in Round 1 but had become food insecure by Round 2. Table 6 shows that the association between the age of the household head and households that “became food secure” (Table 6, Column 4) is significant at the 10 per cent significance level; this implies that rural households with older HHs were more likely to be food secure in Round 2.

The results show that rural households engaged in agricultural and allied activities in Round 1 were more likely to be food secure in Round 2. As the restrictions eased after the lockdowns, non-farm wage labourers returned to work and became food secure in the second round (Table 6, Column 4). Table 6 indicates that rural households with non-farm wage labourers who were food insecure in Round 1 were more likely to be food secure in Round 2; similarly, rural households working in private organisations who were food insecure in Round 1 were more likely to be food secure in Round 2. Rural families with cattle/buffalo who were food insecure in Round 1 were more likely to be food secure by Round 2. The role of livestock in reducing poverty and food insecurity is well-established in the literature (Kumar, 2024).

Finally, for a robustness check, we estimated a probit model on rural households that had been food insecure in the first round and had become food secure by the second round (Table A3). The probit model estimates were consistent with multivariate probit estimates (Table 6).

VI

CONCLUSIONS AND POLICY IMPLICATIONS

The study on food insecurity among rural households in eastern India provides a sober view of the current situation and offers vital pointers for policy intervention. The decline in the percentage of food-secure rural households from the first to the second round of surveys—falling from 29.3 to 21 per cent—signals an alarming trend that calls for immediate and decisive action. Conclusions drawn from the data underscore the intricate relationship between food insecurity and socio-economic factors. A stark disparity is evident across different social strata, with those in the lower echelons, such as SCs, STs, and landless farmers, being the most food insecure. Moreover, the data highlights the vulnerability of migrant households, where the extent of food insecurity is very high compared to non-migrant households.

Given the significant differences in food insecurity among various social groups, social support programs must be more targeted. This implies that the welfare schemes must be designed to address the specific challenges faced by SCs, STs, and other marginalised groups. As food insecurity is closely tied to land ownership and farming status, agricultural policies must be re-evaluated to support landless farmers. The increased vulnerability of migrant households suggests that policies must include protective measures for these populations, possibly through remittance support programmes or by ensuring the portability of welfare benefits across state lines. The focus on food insecurity needs to shift from mere calorie availability to nutritional content. Strengthening food distribution systems, especially in areas with the highest levels of food insecurity, is crucial. This could mean improving the Public Distribution System (PDS) and other food aid initiatives to ensure that they reach the most vulnerable sections of society. Enhancing rural infrastructure, including storage facilities, transportation, and market access, can reduce food waste and improve availability. With agriculture being sensitive to climate conditions, policies must also focus on climate-resilient farming practices to safeguard the increase in food insecurity against the backdrop of changing weather patterns.

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NOTE

1. A Hausman test was conducted to decide which fixed-effect models would work. The Hausman test revealed that a random fixed-effect model would be appropriate here.

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APPENDIX I: SUMMARY OF VARIABLES USED IN THE REGRESSION MODEL

Variable (1)	Mean (2)	Std. Dev (3)
Age of household head (HH) (in years) (in log)	3.87	0.26
Family size (in numbers) (in log)	1.64	0.47
Education of HH (in years) (in log)	2.73	0.32
Operational landholding (in hectares) (in log)	2.36	0.08
<i>Social group: Base-SC and ST</i>		
Other Backward Classes (1 = Yes)	0.45	0.50
General category (1=Yes)	0.23	0.42
<i>Occupation: Base-others</i>		
Agriculture and allied	0.61	0.49
Farm wage labour	0.04	0.19
Non-farm wage labour	0.19	0.39
Trade and business	0.07	0.25
Private employees	0.05	0.22
Work as a migrant (1 = Yes)	0.28	0.45
<i>Awareness of government schemes</i>		
Direct cash transfer (1 = Yes)	0.72	0.45
Work under MGNREGA scheme	0.33	0.47
Has Kisan Credit Card (1 = Yes)	0.16	0.36
Opened bank account under Jan Dhan Yojana (1 = Yes)	0.35	0.48
<i>Other control variables</i>		
Growing cash crops (1 = Yes)	0.37	0.48
Have cattle/buffalo (1 = Yes)	0.40	0.49
HHs income reduced (1 = Yes)	0.75	0.43
Member of a political party (1 = Yes)	0.12	0.32
Share of non-farm income (in log)	3.26	1.49