

Food Security in Rural Bihar: Some Findings from a Longitudinal Survey



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1 Introduction

Bihar is among the poorest states in the country with a very high incidence of poverty. Although in recent years it has witnessed a high rate of growth, the state continues to be among the economically most backward states, with one of the lowest per capita incomes. During the year 2020–21, the per capita net state domestic product (NSDP) of Bihar (Rs. 46,292) was only 36 per cent of India (Rs. 128,829) (RBI, 2021). More than half of the population in the state is multidimensional poor (NITI Aayog, 2021).

Malnutrition continues to remain a matter of grave concern in Bihar. A total of 43 per cent of the children under the age of five are stunted (low height for age) and 23 per cent of them are wasted (National Family and Health Survey (NFHS)-5, 2019–21). According to the composite Sustainable Development Goal (SDG) Index constructed by NITI Aayog, Bihar stood second last in terms of SDG 2 on zero hunger, and overall development indices of Bihar stood last among the states (Government of India, 2020–21). The findings from the fifth round of NFHS indicate that there is only partial improvement in malnutrition indicators in Bihar. Food insecurity is an important dimension of overall malnutrition and poor health, and more so in a state like Bihar. Food security is a complex phenomenon having multi-pronged dimensions. Food security is the product of four different aspects: food availability, i.e. availability of ‘sufficient quantities and quality of food’; food access which indicates households’ access to ‘adequate resources for acquiring appropriate foods for a nutritious diet’; utilization indicating utilization of food through diet and supporting factors or ‘non-food inputs in food security’ such as clean water, sanitation, and health care; and finally, stability, emphasizing that ‘to be food secure, a population, household or individual must have access to adequate food at all times’, given risks such as sudden, unforeseen shocks (FAO et al., 2013). Food security

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policies in developing countries generally focus on the consumption of adequate calories (Barrett, 2010; Suryanarayana, 2013; Tarvinga et al., 2013). The diversified food consumption pattern is determined by factors such as culture, social, demographic, socio-economic, poverty, geographic locations, income, prices, availability, food production, and storage facilities (Gundersen & Garasky, 2012; Jones et al., 2014; Oyarzun et al., 2013; Sarkar, 2014; Styen et al., 2006).

The level of dietary diversity is the proxy indicator of the quality of food consumption (Jones et al., 2014). Dietary diversity is usually measured by the dietary diversity score which summarizes the number of foods or food groups consumed over a reference period taking into consideration the number of servings of different food groups in conformity with dietary guidelines (Swaindale & Bilinsky, 2006). Dietary diversity scores are meaningful indicators of food and nutrition security measures. These scores can be collected through household surveys and can be used to examine food and nutrition security at individual and intra-household levels. Dietary diversity scores correlate with measures of food consumption, and are a good measure of household food access and caloric availability (D'Souza & Jolliffe, 2010). Some researchers and development agencies have suggested using an alternative aggregate index, the Food Consumption Score (FCS), a proxy indicator based on the three components stated above: dietary diversity, food frequency, and relative nutritional importance of different food groups (WFP, 2008, 2009).

In the discussion on food and nutrition security, public services can also play an important role in ensuring food security and improved nutritional status (Kaushal & Muchomba, 2013; Kochar, 2005; Rahman, 2015). The five main programmes which provide social security in India and have played a crucial role in the reduction of poverty, increasing incomes, and reducing malnutrition are Public Distribution System (PDS), Integrated Child Development Scheme (ICDS), Mid-Day Meal Scheme (MDMS), Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), and pensions for widows and elderly (Drèze & Khera, 2017). The rich literature available cites numerous barriers in access to services, and typical system shortfalls in providing these services, which act as a detriment in realizing the potential of food-based safety-nets and interventions, more so for the vulnerable communities such as the tribal households in economically, and agro-climatically backward regions (Drèze & Khera, 2013, 2015). Studies have also highlighted that public programmes, especially during COVID-19, played a pivotal role in terms of providing food to the needy (Sinha, 2021).

This paper analyses the status of food and nutritional security in rural Bihar since 1998, based on a longitudinal survey conducted by the Institute for Human Development (IHD). Bihar is overwhelmingly rural with about 89% of its population residing in rural areas. A total of 12 villages spread over 7 districts, which are representative of the state, were surveyed in 2016 for building the longitudinal database. These households are part of a previous survey conducted in 1981 (details provided in the next section). The paper evaluates the changes in household expenditure on food items in rural Bihar over 18 years across various socio-economic groups. The main findings of a rapid telephonic survey in these villages conducted by IHD in 2021 to

understand the impact of COVID-19 on households' food security have also been reported.¹

The paper is organized as follows. After the Introduction, Sect. 2 provides details of the sampling framework and survey instruments of the study along with its methodology. Section 3 provides details of some broad features of the socio-economic change in Bihar between 1998 and 2016 from the survey data. Section 4 brings together the major findings on various aspects of food security, and the last section provides the conclusions and some policy pointers.

2 Methodology: Database and Survey Instruments

2.1 Database and Sample^{2,3}

As mentioned in the earlier section, in 1981–1983, the A. N. Sinha Institute of Social Studies, Patna, and the International Labour Organization (ILO) undertook an in-depth study of the dynamics of poverty, labour markets, and development in the state of Bihar. The study was based on a representative sample of 36 villages drawn from 6 clusters of districts that formed the plains of Bihar, and which coincide with the geographical composition of present-day Bihar after the plateau region was made into a separate state of Jharkhand in 2000. Community-level data were collected from these 36 villages, and a census and in-depth household surveys were carried out in 12 villages, carefully selected to reflect the principal characteristics of the different regions of Bihar.

In 1998–99, the IHD, New Delhi, organized a resurvey of the same villages, which examined the pattern of change in production, employment, and social structure. The 1998 survey did not collect data from the same households which were covered in 1981–1983; however, the villages were the same, and extensive community-level and household-level data was collected. In 2009–2011, another round of resurvey was carried out for all the longitudinal households surveyed in the 1998–99 round. A total of 1,000 households were interviewed in this round. However, in this survey consumption and food security were not the major components. The survey in 2016–17 was limited to 12 villages for which detailed information was collected as in the preceding surveys. A detailed listing of all the households was done prior to the detailed household survey, and the main occupation of the household was captured. Altogether, around 1,450 households including 1,000 old resurvey households (as

¹ The survey was conducted for the International Growth Centre (IGC) sponsored project 'Food Security during Pandemic Times: Insights and Perspectives from Rural Bihar', October 2021. Two of the authors of this paper (Swati Dutta and Sunil K. Mishra) had undertaken this study. For details, see <https://www.theigc.org>.

² Sharma (1995, 2005) have used various round of IHD-Bihar longitudinal survey data.

³ The study is part of IHD-Bihar Research programme also included in Rodgers et al. (2013) and IHD (2004).

in 2009–2011) and additional 450 new households (to make them a representative sample as in 1981 and 1998) were surveyed.⁴

Further, between November 2020 and February 2021 IHD conducted a telephonic survey in the 12 villages to understand the impact of COVID-19 on household food and nutrition security. In this survey, a total of 944 households were covered and the rest of the longitudinal households could not be covered due to their unavailability because of connectivity or refusal to respond.

To understand the broad changes in consumption expenditure and consumption of different food groups, the study has used 862 common households which were covered in both the 1998–99 and 2016 surveys. However, due to the comparability issues, some of the variables in a particular round have been analysed independently. The impact of COVID-19 on households' dietary diversity has been captured as a separate module in the 2021 survey.

2.2 Study Instruments⁵

The survey collected detailed information on the socio-economic background of the households, the demographic pattern of households, income and assets accessed by households, and employment structure within the households. The food security module covered consumption expenditure, food habits, dietary diversity, food frequency, self-assessed food insecurity, and the functioning of different food-based safety net programmes like PDS.

The survey used a 30 days recall method to assess the expenditure of different food items (separated into cereals, pulses, veggies, fruits, animal products, milk, and others) and 365 days recall period for expenditure incurred on different non-food items by the respondents. A retrospective method with a longer (1 year) reference period was followed for recall of past events of food scarcity, seasonal food availability, etc. Dietary assessments were based on precise recalls for the past week as well as 24 h.

The paper has measured food security with some select indicators. A brief description of these indicators is as follows.

Household Dietary Diversity Score (HDDS): HDDS provides a proxy measure of households' food consumption basket. HDDS is calculated based on the number of food items consumed by the household members on the preceding day of the survey. The list of food groups that were collected is cereals (F1), roots and tubers (F2), vegetables (F3), fruits (F4), sweets (F5), beverages and drinks (F6), meat (F7), eggs (F8), milk (F9), fish (F10), pulses (F11), and oils/fats (F12). If the household consumed the particular food item, we assigned a score of 1; else, 0. The score of the HDDS ranges from 0 to 12 so the higher the HDDS, the higher the household's

⁴ Alakh N. Sharma (one of the authors of this paper) has been part of the study team in all the rounds of this longitudinal survey since 1981.

⁵ Some analysis draws from Mishra et al. (2021). It is being reused with permission.

dietary diversity. HDDS was divided into three broad categories: low dietary diversity score (DDS) (score ≤ 3), medium DDS (4–5), and high DDS (score ≥ 6):

$$\text{HDDS} = F1 + F2 + F3 + F4 + F5 + F6 + F7 + F8 + F9 + F10 \\ + F11 + F12.$$

Food Frequency Score (FFS): FFS is a dietary assessment of the households that captures households' food consumption habits. It collects information on the frequency of days of consumption of different food groups in the past 7 days prior to the survey, i.e. whether the food items were eaten daily (i.e. over 7 days regularly); occasionally (i.e. 3–4 days in a week); rarely (i.e. 1–2 days in a week); or never (0 days in a week). The eight aggregated food groups for this study are staples, vegetables, fruits, animal products (meat/fish/eggs), milk, beans (including nuts and lentils), fats, sweets, and drinks. Each of the food groups was also multiplied by the weight suggested by WFP (2008). This information was collected separately for adults and children:

$$\text{FFS} = 2 * D_{\text{Staple}} + 3 * D_{\text{pulses}} + 1 * D_{\text{vegetables}} + 1 * D_{\text{fruits}} + 4 * D_{\text{meat\&fish\&egg}} \\ + 4 * D_{\text{milk\&milkproduct}} + 0.5 * D_{\text{sugar}} + 0.5 * D_{\text{oil}}$$

where D stands for the number of days for which each food group was consumed during the past days before the survey. The weighted score is divided into three categories: low (0–21), medium (21.5–35), and high (>35), where household FFS is high if both adults and children have high FFS; low if both adults and children have low FFS; and medium for a combination of both high and low FFS.

Household Food Insecurity Experience Scale (HFIES): HFIES was developed by the Food and Agriculture Organization's (FAO) Voice of the Hungry Project for measuring household food security (Ballard et al., 2013). FIES is a direct measure of the severity of household food insecurity that depends on the respondent's direct response to seven brief statements regarding their access to adequate food in the last 12 months. Experience of food insecurity is characterized by uncertainty and anxiety regarding access to food and adjusting the quality of diet due to a shortage of money. The sum of the seven HFIES gives us the food insecurity status of the households where if the score is greater than or equal to 1, then the household is food insecure. A household is identified as severely insecure if the score is between 6 and 7. If the score is between 4 and 5, then the household is moderately food insecure. If the score is between 1 and 3, the household then is mildly insecure.

Required Dietary Allowance (RDA): The energy norms based on which the Planning Commission Task Force (Alagh Committee) poverty lines were derived, and which had been the basis for the poverty lines worked out by the Lakdawala Expert Group, is 2,400 kcal per capita per day in rural areas and 2,100 kcal per capita per day in urban areas. The Rangarajan Expert Group took a considered view that

deriving the food component of the Poverty Line Basket required reference to the simultaneous satisfaction of all three nutrients (energy, protein, and fat). Accordingly, this Expert Group computed the average requirements of energy, protein, and fat on Indian Council of Medical Research (ICMR) norms differentiated by age, gender, and activity for all-India rural and urban regions to derive the normative levels of nourishment and worked out the energy requirement as 2,155 kcal per person per day in rural areas and 2,090 kcal per person per day in urban areas (MoSPI and WFP, 2019).⁶ The protein and fat requirements were estimated as 48 g and 28 g per capita per day, respectively, in rural areas. Based on this cut-off, the paper has identified the percentage of households who are deprived in terms of consumption of energy, protein, and fat.

3 Some Salient Features of Socio-Economic Change in Rural Bihar, 1998–2016

Before we discuss food security, it will be interesting to shed light on some broad socio-economic changes that occurred during the 18 years, i.e. between the two survey periods of 1998 and 2016.

3.1 *Changes in Caste and Class Structure*

The class and caste structure of the society is very important for the rural economy of Bihar. It reflects the pattern of ownership and use of land, and the social and economic relations governing work and employment.

Between 1998 and 2016, there has been a decline in the share of forward and Other Backward Class (OBC)-II (upper backward) households by about 6 and 4 percentage points, respectively. The share of OBC-I (lower backward castes), on the other hand, has increased by 6 percentage points during the same period. The scheduled caste (SC) households are about one-fourth of the total sample, and have witnessed a slight increase of 2.6 per cent in their share. In contrast to the stability of caste and community, there have been substantial changes in the class pattern in the last 18 years. The proportion of agricultural labour cultivating households and landlords has declined by 13 and 7 percentage points, respectively. There has been a marginal decline in the middle peasant households and the proportion of small peasant households has remained the same, but the big peasant households and agricultural labour non-cultivating households have increased. The share of non-agricultural households has increased by 15 percentage points in the 18 years period

⁶ ICMR-NIN (2020) although recommended for RDA specific values for rural areas; however, these are not given. Therefore, the study has compared and used ICMR (2010) RDA cut-off for rural areas.

primarily due to a decline in landholding size and relative growth of non-agricultural sources of livelihoods.

3.2 Changes in Ownership of Land and Other Assets

Land is an important asset in the context of rural Bihar though income from the land may not constitute the highest share of total income, especially for those with small plots of land at their disposal. Over the years, as expected there has been a change in the distribution of landholdings. The proportion of landless households increased by 11 percentage points between 1998 and 2016. There has been a marginal decline in the households belonging to the land size of less than 1 acre. Those with 1 to 2.49 acres of land recorded a decline of 6 percentage points and this trend is similar for all categories (Fig. 1).

The caste-wise operational landholding size shows that the SCs have experienced a big increase in landlessness in 18 years from 54 per cent in 1998 to 86 per cent in 2016. Consolidation of holding is rather non-existent in the State. The average landholding was 1.79 acres in 1998, which has come down to 0.77 acres in 2016. The size of average landholdings with certain caste groups like upper castes and OBC-II castes is higher than those with the other caste group. Further, the average size of landholdings with vulnerable social groups like the SCs is much lower than the other caste groups (Table 1).

It is also important to see the composition of the non-land assets in the context of rural Bihar and how the value of the assets has changed between 1998 and 2016 across caste and classes. As can be seen from Table 2, in general the level of value of non-land assets is quite small in Bihar and further it is dominated by dwelling in both periods. The rest of the assets contributed only one-fifth of the monetary value of the assets in both periods.

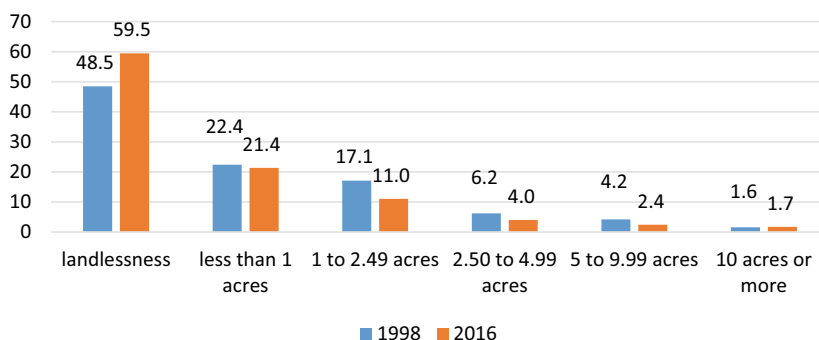


Fig. 1 Changes in land size: 1998–2016 (in %). *Source* IHD-Bihar longitudinal survey, 1998, 2016. *Note* The subsequent figures and tables are based on the various rounds of Bihar longitudinal survey, otherwise stated

Table 1 Changes in ownership of landholdings and landlessness by caste: 1998–2016

Social groups	Landless (%)			Average landholding (Acres)	
	1998	2016	Change	1998	2016
Forward castes	14.96	26.87	11.91	3.20	2.05
OBC-I (upper backward)	62.58	72.46	9.88	0.75	0.43
OBC-II (lower backward)	29.12	36.15	7.03	1.55	1.03
Scheduled castes	54.00	85.43	31.43	0.31	0.12
Muslims	61.62	72.82	11.20	1.14	0.52
Total	44.33	59.40	15.07	1.79	0.77

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 2 Per household value of the asset by type: 1998 and 2016 (at current price in ₹)

	Per household value of non-land assets, 2016 (Rs)	Per household value of non-land assets, 1998 (Rs)
Dwelling	328,322	52,351
Productive asset	9,149	4,731
Other assets	42,650	4,761
Livestock	12,013	4,404
Total	392,134	66,246

Source IHD-Bihar longitudinal survey, 1998, 2016

There has been a substantial increase in the value of the assets except for livestock and productive assets. The largest increase was observed for other assets which include households' amenities like furniture, television, refrigerator, and mobile phones, among others. A much lower increase is observed in the value of livestock and productive assets. In real terms, there is hardly any increase in the value of non-land assets in these two categories. This indicates the lack of capital accumulation over 18 years which is a long-term constraint on the growth in the agricultural sector. Non-agriculturist and small peasant households which followed agriculture labour in households have shown greater improvement in asset values compared to the rest of the groups (Fig. 2). Changes in the value of assets are much higher among OBC-I followed by SC and Muslim households (Fig. 3). In both the cases, it is mostly driven by the increase in the value of other assets. This indicates that as a whole the distribution of assets over time has been in a progressive direction.

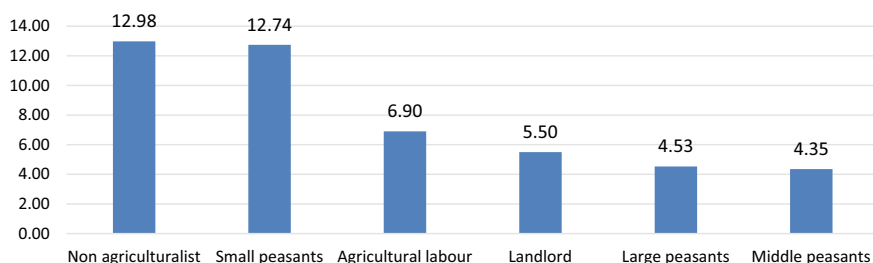


Fig. 2 Change in value of assets other than land in Bihar by class: 1998–2016. *Source* IHD-Bihar longitudinal survey, 1998, 2016. *Note* Ratio of value of assets in 2016 to value of assets in 1998

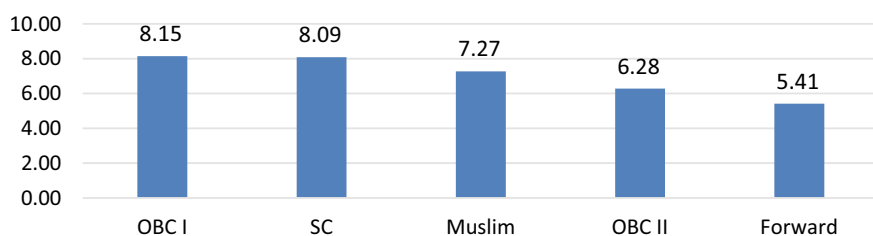


Fig. 3 Changes in the value of assets other than land by caste: 1998–2016. *Source* IHD-Bihar longitudinal survey, 1998, 2016

3.3 Changes in Income and Migration Pattern

Table 3 shows that the average annual income has increased by around 7 times in the nominal term from around ₹2,000 in 1998 to ₹ 141,101 in 2016. Among the caste groups, the Muslims have witnessed the highest increase in income at 9 times during the 18 years, whereas OBC-II and upper caste households have witnessed the lowest increase at 6 and 6.2 times, respectively (Table 3). Class-wise, it is seen that the increase in income is highest for the non-agriculture and small peasant households and the lowest for the large and middle peasant households (Table 4). Like assets, income distribution also seems to be in a progressive direction during the 18-year period.

Migration is an important strategy for households in rural Bihar to reduce livelihood vulnerability as well as to improve the food security condition of the households. It has played a crucial role not just in increasing incomes but also in enhancing social mobility. Between 1998 and 2016, there has been a 20 percentage point increase in the incidence of migration—close to two-thirds of the household migrants in 2016 and 2021 (Fig. 4). Overall, the average annual income per migrant was estimated at Rs 97,744 and the average annual remittance at Rs 48,662. The share of income sent as remittance was about 50 per cent in 2016.

Table 3 Mean annual income by caste/religion (value in Rs): 1998–2016

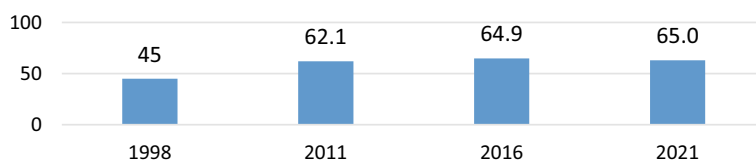
Caste/Religion	1998–99 (in Rs)	2016 (in Rs)	Ratio 2016/1998
SC/ST	14,248	115,863	8.13
OBC I	13,784	123,343	8.95
OBC II	24,004	145,229	6.05
Muslim	16,817	156,842	9.33
Forward	28,325	175,846	6.21
Average	20,228	141,101	6.98

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 4 Mean annual income by class (value in Rs): 1998–99–2016

Class	1998–99 (in Rs)	2016 (in Rs)	Ratio 2016/1998
Agricultural labour	13,311	96,600	7.26
Small peasant	14,240	162,525	11.41
Medium peasant	22,023	108,989	4.95
Large peasant	31,790	145,989	4.59
Landlord	30,674	250,024	8.15
Non-agriculturist	10,764	155,649	14.46
Average	20,228	141,101	6.98

Source IHD-Bihar longitudinal survey, 1998, 2016

**Fig. 4** Proportion migrant households 1998–2021. Source IHD-Bihar longitudinal survey, 1998, 2016

4 Changes in Various Dimensions of Food Security in Rural Bihar

The two rounds of surveys carried out in 1998 and 2016 collected somewhat detailed data on various aspects of food security. In this section, we will discuss a few aspects of food security based on the survey data.

4.1 Changes in Consumption Expenditure

The study collected the expenditure on food items on 30 days reference period and non-food expenditure on 365 days recall period. Due to the panel nature of the data set, it is possible to compare the average consumption expenditure in the two time periods and the shift in the allocation of total expenditure in food and non-food items between 1998 and 2016. Overall, the findings throw light upon whether there have been any changes in the allocation of expenditure baskets since 1998. Table 5 shows that the monthly per capita consumption expenditure (MPCE) which was around Rs 453 in 1998 increased to Rs 552 in 2016 in real terms, i.e. on average, there is an increase of 21.85 per cent between the two periods. The median MPCE which was Rs 279 in 1998 increased to Rs 340 in 2016. The data also reveals that non-migrant households have higher MPCE than migrant households. Further, the migrant households experienced a larger increase (1.4 times) in MPCE than the non-migrant households (1.2 times) (Fig. 5). Between 1998 and 2016, household's average food expenditure increased from Rs 279 in 1998 to Rs 290 in 2016, experiencing an increase of 4 per cent.

Table 5 MPCE of the panel households (Rs): 1998–2016

	Mean	Median	P25	P75	Maximum	Minimum
MPCE-2016	552	340	228	581	12,944	70
MPCE-1998	453	279	187	477	10,626	57
Monthly per capita food-2016	290	258	181	357	1855	45
Monthly per capita food-1998	279	209	140	331	3137	40

Source IHD-Bihar longitudinal survey, 1998, 2016

Note Values are in 1998 constant prices

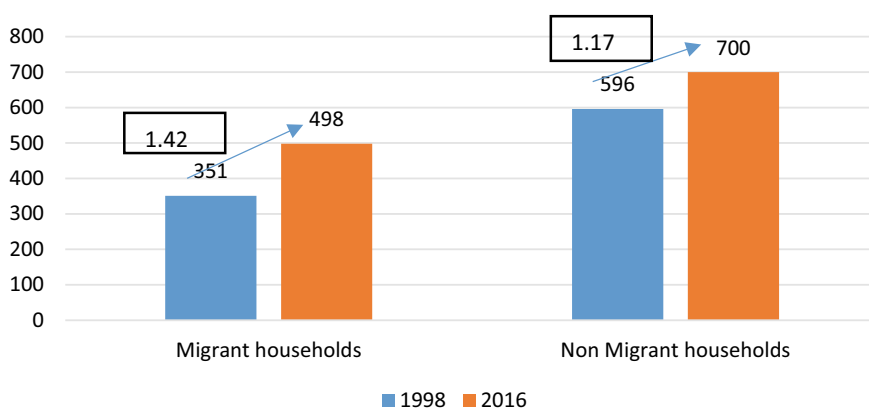


Fig. 5 Changes in MPCE (in Rs at constant prices) by migration status: 1998–2016. Source IHD-Bihar longitudinal survey, 1998, 2016

Similar to all India level in rural Bihar also, as the real income of the households increases there is a decrease in the share of expenditures on food items and an increase in the share of non-food items. The median households experienced a 13 per cent increase in household food expenditure, whereas there was a 39 per cent increase in non-food expenditure in 2016 compared to 1998. Across the households, a quarter of them experienced a food expenditure fall of 23 per cent or greater, while three-quarters of them experienced an increase of 73 per cent. Further, at least 25 per cent of the households experienced a non-food expenditure increase by 2.75 times (Table 6).

Irrespective of the caste of the households, there is a decrease in the share of food consumption expenditure between 1998 and 2016. The share of food consumption expenditure was the highest for the households belonging to OBC-I. Data also reveals that the decrease in the share of food consumption expenditure was also highest for households belonging to OBC-I and the lowest for the general caste households (Fig. 6).

Households belonging to different quintile groups of the MPCE distribution represent a series of sub-populations with progressively increasing levels of living. The

Table 6 Changes in food and non-food expenditure, 1998 and 2016

	Ratio of food expenditure*	Ratio of Non-food expenditure*
Mean	1.36	2.19
Median	1.13	1.39
P25	0.77	0.04
P75	1.73	2.75

Source ID-Bihar longitudinal survey, 1998, 2016

Note *—The ratio of 2016 expenditure to 1998 expenditure

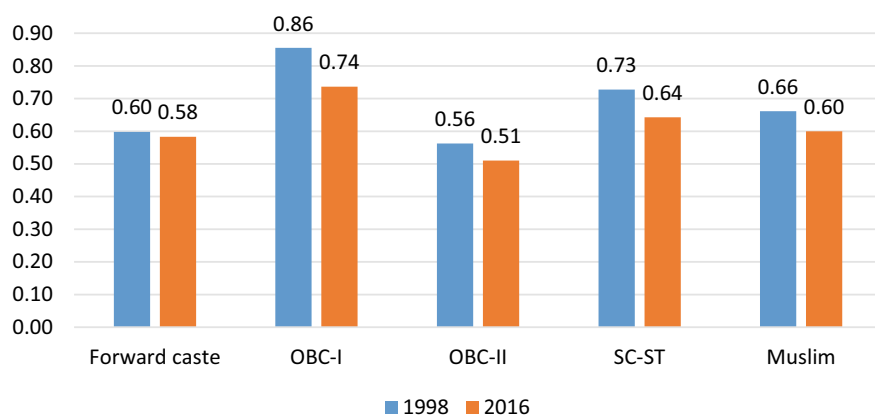


Fig. 6 Changes in share of food consumption expenditure out of total expenditure by caste: 1998–2016. Source IHD-Bihar longitudinal survey, 1998, 2016

variation in the budget share of any particular item across MPCE-quintile groups, therefore, enables to study the variation in consumption behaviour with the rise in the level of living. Figure 7 shows that the share of food expenditure out of total expenditure varies from 49 per cent in the richest class to 77 per cent in the poorest class in 2016. This shows a somewhat significant inequality in food expenditure among the consumption expenditure class. Irrespective of the consumption expenditure class, there is a decrease in the share of food expenditure between 1998 and 2016, and it is highest in the middle class (10 percentage points) and lowest in the richer class (6 percentage points).

There is also a significant transition among consumption expenditure classes between 1998 and 2016. Table 7 shows that 28 per cent of the households were shown to belong to the poorest class in both periods. Over one-third of the households that were in the poorest category in 1998 moved upward to the poor expenditure class in 2016. Importantly, 18.5 per cent moved from the poorest class in 1998 to either the richer or richest consumption expenditure class in 2016. On the other hand, over one-fifth of the households that belonged to the richest class in 1998 moved below to either the poorest or poor expenditure class in 2016. About 40 per cent of the households who were richest in 1998 continue to maintain their status as belonging to the richest expenditure class in 2016.

Over time, there has been an increase in the share of all food items at the cost of cereals. In 1998, almost three-fifths of the food expenditure was spent on cereals whereas in 2016 it reduced to 23 per cent, implying a decline of 37 percentage points. The expenditure on pulses, vegetables, meat and eggs, milk, and milk products increased rather significantly (Table 8). Clearly, Engel's law is operating, i.e. as the income of poor people rises consumption of staple food, which is a cheaper source of calories, is likely to decline. A decline in cereal consumption has been substituted with the increased consumption of high-value commodities. The shift away from cereal consumption is significant across all households in different expenditure groups (Table 9). Between 1998 and 2016, the share of expenditure on cereals declined by 28 percentage points in the poorest class and 24 percentage points in the

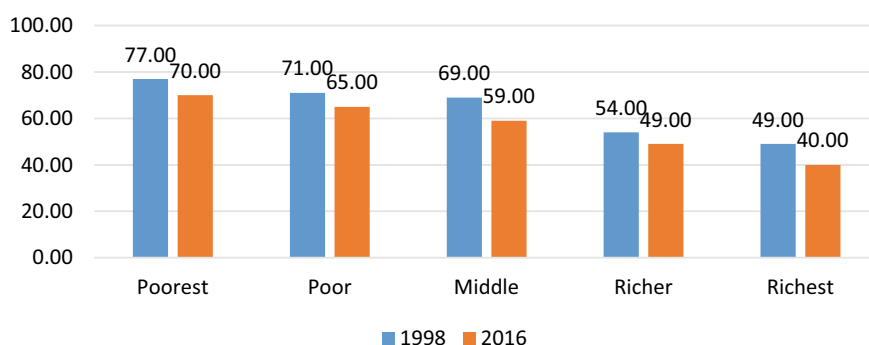


Fig. 7 Changes in share of food consumption expenditure out of total expenditure by class: 1998–2016. *Source* IHD-Bihar longitudinal survey, 1998, 2016

Table 7 Transition in consumption expenditure by class between 1998 and 2016 (in %)

		2016				
		Poorest	Poor	Middle	Richer	Richest
1998	Poorest	28.3	33.0	20.2	12.7	5.8
	Poor	8.5	32.4	28.4	15.7	15.1
	Middle	5.3	10.0	29.1	31.3	24.3
	Richer	6.2	8.5	24.7	33.8	26.8
	Richest	7.6	15.1	16.9	20.9	39.5

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 8 Changes in components of food items expenditure: 1998–2016

	1998	2016
Cereals	59.4	22.8
Pulses	3.7	8.9
Vegetables	9.8	13.5
Meat	4.9	9.3
Eggs	1.0	8.0
Milk and milk products	3.6	10.8
Fruits	2.1	7.4
Edible oil	4.0	6.0
Other	12.0	13.2

Source IHD-Bihar longitudinal survey, 1998, 2016

richest class. Expenditure on pulses increased by 7.2 percentage points in the poorest class and 2.1 percentage points in the case of the richest class. In the case of meat, the share of expenditure increased by 9.6 percentage points in the poorest class and 5.4 percentage points in the richest class. However, in the case of milk and egg, the increase in the share of expenditure was higher for the richest class than the poorest class (Table 9).

4.2 Quantity of Major Food Group Consumption and Required Dietary Allowances

The survey also investigated variations in the consumption of different food items in a month per person between 1998 and 2016 (Fig. 8). It is seen that there is a sharp reduction in the consumption of cereal from 17.5 to 12.4 kg. Also, vegetable consumption reduced from 6 to 2 kg between the same periods. However, households experienced an increase in the consumption of milk from 2.4 to 10 kg. Meat and egg consumption also marked an increase in consumption per month in 2016 compared

Table 9 Changes in pattern of food expenditure by poorest and richest class: 1998–2016

	Poorest		Richest		1998–2016	
	1998	2016	1998	2016	Poorest	Richest
Cereals	69.0	38.0	40.9	13.8	28.1	24.2
Pulses	2.9	7.2	5.8	7.9	7.2	2.1
Vegetables	3.7	5.1	7.6	8.3	5.1	0.7
Meat	2.3	9.6	5.0	10.4	9.6	5.4
Eggs	0.2	3.0	3.0	9.0	3.0	6.0
Milk and milk products	1.7	5.9	5.7	14.2	5.9	8.5
Fruits	1.8	6.0	5.0	7.3	6.0	2.3
Edible oil	2.0	3.0	4.0	5.0	3.0	1.0
Other	16.4	22.0	20.9	24.4	5.6	3.5

Source IHD-Bihar longitudinal survey, 1998, 2016

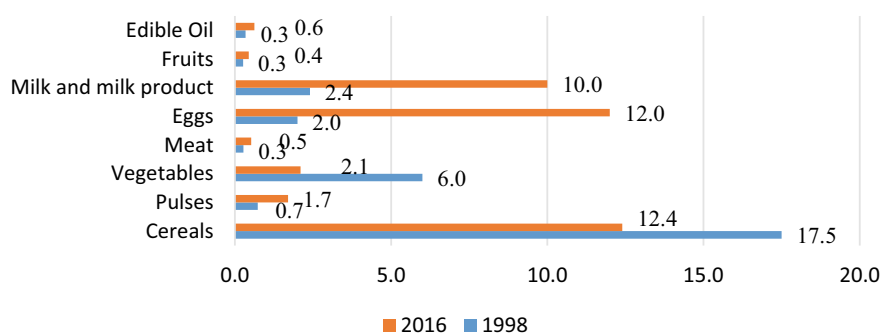


Fig. 8 Changes in quantity of food consumption (per person per month): 1998–2016. Source IHD-Bihar longitudinal survey, 1998, 2016

to 1998. Consumption of eggs increased from 2 (per person per month) in 1998 to 12 (per person per month) in 2016. Consumption of fruits and pulses also increased from 0.3 to 0.4 and 0.7 to 1.7 kg, respectively. Overall, there is an improvement, albeit small, in the quantity of food consumption.

It will be interesting to see how the consumption of different food items has varied across MPCE classes. It is seen that in both periods, the quantity of cereal consumption reduced whereas consumption of other food items increased when households moved from the poorest class to the better-off economic class. However, the gap between the poorest and richest consumption classes in terms of quantity consumed reduced for all food groups except for the consumption of eggs (Table 10).

The problems of poor nutrition and food insecurity are intertwined. Poor nutritional outcomes are closely linked to food security in India. A large part of the Indian population cannot meet the basic calorie, protein, and fat requirements. Also, a large proportion of the population consumes a diet that lacks adequate dietary diversity, thus affecting their micronutrient intake (MoSPI and WFP, 2019; ICMR-NIN, 2020).

Table 10 Consumption of various food items by socio-economic status of the households: 1998–2016

		Cereals quantity (kg)	Pulses and pulse products quantity (kg)	Vegetable (Kg)	Fruits quantity (kg)	Non-veg (meat and fish) kg	Eggs quantity (no)	Milk and milk products quantity (kg)
1998	Poorest	27.18	0.2	2.55	0.1	0.23	0.78	0.72
	2nd quintile	23.34	0.4	3.04	0.22	0.35	1.09	1.91
	3rd quintile	19.22	0.4	3.66	0.29	0.41	1.25	2.4
	4th quintile	13.2	0.9	7.53	0.37	0.57	1.82	3.4
	Richest quintile	11.21	1.0	8.85	0.56	0.55	2.1	5.23
2016	Poorest	21.2	0.9	1.2	0.3	0.3	2.1	3.1
	2nd quintile	19.2	1.0	1.7	0.4	0.3	4.8	6.6
	3rd quintile	15.21	1.2	2.2	0.5	0.3	9.2	8.1
	4th quintile	10.0	1.4	3.3	0.6	0.4	11.3	11.3
	Richest quintile	8.32	2.5	4.0	0.6	0.7	15.7	12.1

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 11 Changes in per capita per day energy, protein, and fat consumption: 1998–2016⁷

	1998	2016
Per day per person energy (kcal)	2161	2542
Per day per person protein (Gram)	52.7	55.3
Per day per person fat (Gram)	29.5	39.9

Source IHD-Bihar longitudinal survey, 1998, 2016

Therefore, we have analysed the households' required dietary allowances and how it varies across the socio-economic class. It is estimated that per day per capita energy consumption which was 2161 kcal in 1998 increased to 2542 kcal in 2016. The consumption of fat also increased from 29.5 g in 1998 to 40 g in 2016. However, the consumption of protein increased only marginally from 52.7 g in 1998 to 55 g in 2016 (Table 11).

⁷ According to NSSO 68th round (2011–12), calories, protein, and fat consumption in rural Bihar was 2242 kcal, 62.9 g, and 39 g, respectively. The corresponding figures for NSSO 55th round (1999–2000) were 2121 kcal, 58.7 g, and 26.6 g, respectively.

The data disaggregated by MPCE-quintile class reveals that there is a drastic increase in per capita consumption of energy, protein, and fat from the poorest MPCE-quintile class to the richest class. In 2016, the consumption of energy in the richest MPCE-quintile class is 1.6 times higher than the consumption of energy in the poorest MPCE class. In the case of protein, it is seen that the consumption of protein is 2.05 times higher in the richest class than in the poorest class. The consumption of fat is also 3.05 times higher in the richest class than in the poorest class. The gap between the poorest and richest classes in terms of consumption of energy, protein, and fat reduced in 2016 compared to 1998 (Table 12).

Among the caste groups, per day per capita energy intake, as well as those of protein and fat, was lowest among OBC-I and SC groups in 1998. On the other hand, in 2016 calorie intake was the highest among the SC households, while the consumption of protein and fat was the lowest among them. Also in both 1998 and 2016, protein intake was the highest among the forward caste and Muslim groups. It is also seen that between 1998 and 2016 calorie intake was almost the same among the forward caste households, but among OBC-I households and SC households, it increased by approximately 700 to 900 kilo calories (kcal) (Table 13).

Table 12 Per capita per day energy, protein, and fat consumption by MPCE-quintile class: 1998–2016

	1998	2016	1998	2016	1998	2016
	Per day per person energy (kcal)		Per day per person protein (Gram)		Per day per person fat (Gram)	
Poorest	1700	1900	27	37	14	19
Poor	1790	2158	39	48	23	28
Middle	2100	2300	47	54	27	33
Richer	2361	2661	58	64	39	43
Richest	2890	3106	66	76	48	58

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 13 Per capita per day energy, protein, and fat consumption by caste, 1998–2016

	1998	2016	1998	2016	1998	2016
	Per day per person energy (kcal)		Per day per person protein (Gram)		Per day per person fat (Gram)	
Forward caste	2361	2424	54	58	33	36
OBC-I	1875	2664	39	54	25	37
OBC-II	2120	2375	44	56	33	44
Scheduled caste	1986	2869	40	51	22	27
Muslims	2000	2428	51	59	36	39

Source IHD-Bihar longitudinal survey, 1998, 2016

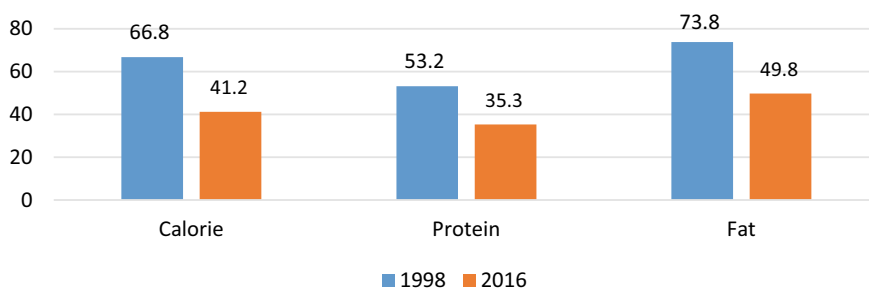


Fig. 9 Percentage of households deprived of required dietary allowance: 1998–2016. *Source* IHD-Bihar longitudinal survey, 1998, 2016

We have identified the percentage of households who are deprived in terms of consumption of energy, protein, and fat based on the cut-off given by the Task Force committee (see the methodology above). In Bihar, calorie deprivation (i.e. population consuming less than 2200 cal) was calculated as 78 per cent (Nayyar & Nayyar, 2016) based on the NSSO 61st and 68th consumption expenditure rounds. The survey data reveals that the percentage of household members with below-recommended calorie intake decreased from 67 per cent in 1998 to 41 per cent in 2016 (decrease of 25.6 percentage points). Also, protein deprivation reduced by 18 percentage points, and fat deprivation reduced by 24 percentage points (Fig. 9).

By MPCE-quintile class, it is observed that in 2016, 52 per cent of households in the poorest MPCE-quintile were deprived in energy consumption, 45 per cent in protein consumption, and 62 per cent in fat consumption. This indicates the severe nutrition shortage among the households that belong to the poorest MPCE-quintile class. It is also seen that the household's deprivation level improves with the increase in the MPCE-quintile class. On the other hand, it is observed that one-third of the households in the richest MPCE class are deprived of energy consumption. Further, 27 per cent of the richest households are deprived of protein and 35 per cent are deprived of consumption of fat. Between 1998 and 2016, the reduction in energy deprivation was highest in the middle quintile class (30 percentage points) followed by the poorest (25 percentage points), and poor quintile class (21 percentage points). The reduction in protein deprivation is also highest in the two bottom MPCE-quintile classes and lowest in the middle quintile class (Table 14).

In both periods, energy, protein, and fat deprivation were highest among the SC group and lowest among the forward castes. The reduction in deprivation of protein and fat is highest among SC and Muslim households, while the reduction in energy deprivation is highest among the forward caste households (Table 15).

Table 14 Percentage of households deprived of required dietary allowance by MPCE-quintile class: 1998–2016

	1998			2016		
	Calorie	Protein	Fat	Calorie	Protein	Fat
Poorest	77	68	85	52	45	62
Poor	72	67	74	51	38	60
Middle	69	51	71	39	48	48
Richer	52	45	67	38	35	44
Richest	39	38	54	30	27	35

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 15 Percentage of households deprived of required dietary allowance by caste: 1998–2016

	1998			2016		
	Energy	Protein	Fat	Energy	Protein	Fat
Forward caste	39	41	52	21	24	39
OBC-I	68	55	67	55	39	52
OBC-II	52	48	62	41	31	45
Scheduled caste	74	65	79	65	42	55
Muslims	62	47	62	49	29	40

Source IHD-Bihar longitudinal survey, 1998, 2016

4.3 Perception of Households About Food Security

A few qualitative questions were also canvassed in the survey about the perceptions of the households about food security. Less than 10 per cent of the households reported insufficiency of food in any month of the year. The insufficiency of food reported was highest among the SC households (16 per cent) and casual worker households (23 per cent). Overall, the consumption of two meals per day has increased from 78 per cent in 1998 to 82 per cent in 2016. For SC households, it increased from 53.5 per cent to 71 per cent, an increase of 17.5 percentage points. The proportion of OBC-I households having 2 meals increased by 13 percentage points in 2016 compared to 1998. However, in the case of forward caste, OBC-II, and Muslim households, there was only a small increase of 3 percentage points.

There are also significant changes in the proportion of households having two meals in a day across MPCE-quintile class. There is an increase of 20 percentage points in the proportion of households who had two meals in the poorest class in 2016 compared to 1998, while in the richest class the proportion increased by 6.8 percentage points (Table 16).

The survey also asked about the frequency of consumption of different food items by the household within the 7 days before the survey (Table 17). In both 1998 and 2016, cereal and edible oil were consumed regularly by all households.

Table 16 Percentage of households who had full meals a day: 1998–2016

MPCE quintiles	1998	2016	Percentage change
Poorest	60.1	79.9	19.8
Poor	71.5	80.1	8.6
Middle	76.7	84.6	7.9
Richer	77.9	85.1	7.2
Richest	80.4	87.2	6.8
Total	75.0	82.3	7.3
<i>Caste</i>			
Forward	89.5	92.2	2.7
OBC-I	70.4	83.7	13.3
OBC-II	80.3	83.4	3.1
SC	53.5	71.0	17.5
Muslims	78.1	81.5	3.4

Source IHD-Bihar longitudinal survey, 1998, 2016

Table 17 Changes in the frequency of food group consumption in Rural Bihar (in %): 1998–2016

	1998			2016		
	Regularly	Occasionally	Rarely	Regularly	Occasionally	Rarely
Cereals	100	0	0	100	0	0
Pulses	3	8	89	22	38	40
Vegetables	45	49	6	55	32	13
Meat	3	7	90	30	44	26
Eggs	2	8	90	85	8	7
Milk and milk products	11	22	67	61	33	6
Fruits	0	19	81	25	49	26
Edible oil	99	1	0	100	0	0

Source IHD-Bihar longitudinal survey, 1998, 2016

In the case of pulses, 89 per cent of the households consumed them rarely in 1998, whereas over one-fifth of such households regularly consumed them in 2016. Meat and eggs were consumed rarely in 1998. However in 2016, over four-fifths of the households consumed eggs regularly and 74 per cent consumed meat either regularly or occasionally. In 1998, about two-thirds of the households consumed milk or milk products rarely, and over four-fifths consumed any fruits rarely in 1998. But in 2016, three-fifths of the households consumed milk and one-fourth of the households consumed fruits regularly. Clearly in 18 years, there has been a rather significant improvement in the consumption of quality food.

Table 18 Food groups consumption by households in the last 24 h (N = 1000), 2016 (in %)

Cereals	100
Pulses	62
Roots and tubers	20
Vegetables	92
Fruits	10
Milk and milk products	54
Eggs	8
Fish	9
Meat	5
Sweets	23
Oil/spices/fat	98
Drinks and beverages	73

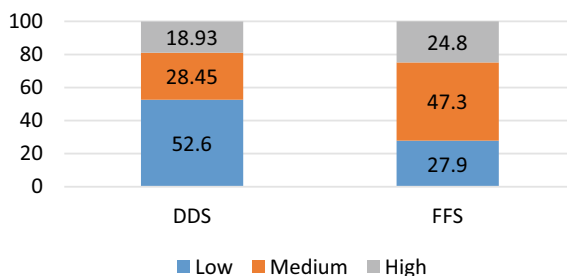
Source IHD-Bihar longitudinal survey, 2016

Household Dietary Diversity and Food Frequency Score

In 2016, the survey canvassed a detailed module on households' consumption of different food groups which allows us to analyse the food consumption pattern of the households and how it varies across the socio-economic class. The HDDS is calculated based on different number of food groups. The mean HDDS was 6.03 (SD 1.7). All the households consumed cereals, oils, and spices/fat on the day before the survey (Table 18). In all, 92 per cent of the households consumed vegetables, 20 per cent consumed roots and tubers, and 62 per cent of the households consumed pulses. The least reported consumption group is fish (9 per cent), eggs (8 per cent), meat (5 per cent), and fruits (10 per cent). When HDDS is split into three categories (high/medium/low dietary diversity), 53 per cent of households are found to have low dietary diversity, 28 per cent have medium dietary diversity, and about 19 per cent were found to have high dietary diversity.

As regards the FFS, the mean FFS is 42.86 (SD 1.49) for adults and 39.21 (SD 12.14) for children. Based on the FFS, approximately one-third of the households lie at the low aggregate. FFS-based classification shows that almost half of the households cluster at moderate levels of food frequency (Fig. 10).

Fig. 10 Household food security status by HDDS and HFFS:2016. Source IHD-Bihar longitudinal survey, 2016



Caste-wise analysis shows that the upper castes demonstrate a lower proportion of households having low DDS. Among the OBC-I caste, which is considered to be the poorest among the OBC category, half of the total households fall in the lower DDS group, whereas about one-fifth of the total households remained in the high DDS group. Among the OBC-II, 33 per cent of the total households remained in the low DDS category and one-fifth of the households belong to high DDS. More than three-fourths of the total SC households demonstrate low DDS, whereas 11 per cent belonged to the higher DDS category. It is also seen that 54 per cent of the Muslim households belonged to the low DDS category. FFS of the households revealed that the percentage of households with low FFS is lowest among the forward caste households and highest in the scheduled caste households (Table 19).

Household socio-economic well-being has a clear and strong influencing pattern with different food security measures considered in this paper. In terms of dietary diversity, which indicates the qualitative aspects of food security, the proportion of households with higher dietary diversity or higher food frequency scores steadily increases across the MPCE-quintile groups.

The other important point which emerges from the analysis is that food insecurity is not only limited to the poorest MPCE class. 34.5 per cent of the households in rural Bihar in the two upper MPCE quintiles, representing the top 40 per cent of the expenditure distribution, is found to have low DDS and 22 per cent of the households belonging to the two richest MPCE classes also have low FFS (Table 20).

We have also constructed DDS by household's educational level of the households. It can be seen that with the better educational level of households, DDS improves (Table 21). With the higher secondary and above level of education, 38 per cent of the households have low DDS, whereas if household members are illiterate then 65 per cent of them have low DDS. There is also a 26 percentage point increase in the percentage of households with high DDS if households have higher secondary and above levels of education as against if households' members are illiterate.

For household food frequency scores, it is seen that almost half of the households have a low FFS if households' members are illiterate whereas only 11 per cent of the households have a low FFS if households' members have a higher secondary and above level of education. Further, among households with high FFS, the score is

Table 19 Household dietary diversity and food frequency score by caste (in %)

	DDS			FFS		
	Low	Medium	High	Low	Medium	High
Forward Caste	31.43	39.45	29.12	13.53	46.99	39.48
OBC-I	50.28	32.55	17.17	23.11	47.90	28.99
OBC-II	33.00	47.40	19.70	14.94	57.14	27.92
Scheduled Caste	76.70	12.30	11.00	49.31	40.25	10.44
Muslims	53.90	23.90	22.20	18.87	48.11	33.02

Source IHD-Bihar longitudinal survey, 2016

Table 20 Different measures of household food insecurity by MPCE-quintile class (in %)

		MPCE-quintile class				
		Poorest	Poor	Middle	Richer	Richest
HDDS	Low	39.1	35.5	24.7	22.9	11.6
	Medium	52.4	54.1	68.7	62.8	57.2
	High	8.5	10.4	13.5	14.6	31.5
HFFS	Low	56.9	49.5	37.4	14.8	7.6
	Medium	32.2	38.4	50.4	60.2	65.6
	High	11.0	12.3	13.1	25.1	26.7

Source IHD-Bihar longitudinal survey, 2016

Table 21 Household food insecurity measure by highest education level of the households and income source (in %)

	HDDS			HFFS		
	Low	Medium	High	Low	Medium	High
<i>Highest education level of the household</i>						
Illiterate	65.3	27.5	7.2	48.1	37.7	14.3
Primary	59.6	29.2	11.2	41.9	40.7	17.4
Middle	48.2	37.3	14.5	30.3	45.4	24.3
Secondary	44.2	33.6	22.2	23.1	53.8	23.1
Higher secondary and above	38.2	28.5	33.3	11.2	57.8	31.0
<i>Main income source</i>						
Self-employed	59.2	28.7	12.1	37.5	50.7	11.8
Casual workers	62.1	27.8	10.1	32.2	42.3	25.5
Salaried workers	39.2	26.7	34.1	19.0	37.0	44.0
Remittances dependent	41.2	40.6	18.2	29.0	45.6	25.4

Source IHD-Bihar longitudinal survey, 2016

more than 2 times higher for a household with a higher secondary and above level of education as compared to illiterate households. It may be mentioned that education level is closely associated with the socio-economic status of the households.

Concerning the main income source of the households, it is seen that low HDDS is highest among casual wage households followed by self-employed households. Household with high HDDS is more than 2.8 times higher for households dependent on salary than households dependent on self-employment. In the case of FFS, it is seen that a household with low FFS is almost 2 times lower for household depending on salary as compared to a household that depends on self-employment. Further, households, with high FFS, are 3.7 times higher for households depending on salary as compared to a household that depends on self-employment and 2.7 times higher as compared with casual wage-dependent households. The households with salary

work have better DDS than the rest of the households. The households that depend on remittances belong to medium DDS as well as FFS.

4.4 Food Security and Public Programmes: The Role of PDS

The survey collected data on utilization, benefits received, and perceptions on quality aspects or relative contribution of the PDS from the viewpoint of ensuring or influencing FSN outcomes. As far as PDS is concerned, two-thirds of below poverty line (BPL) households received foodgrains from PDS. While the availability of staples—mostly rice and wheat—through PDS not only helps households to overcome the persistent risks of food shortages but also helps the household to reduce their budgetary outlays on staples and afford a more varied diverse diet, the analysis shows that households with high reliance on PDS supplies appear to have high DDS and FFS. Further, deprivation in terms of calorie protein and fat is also low when households have a high reliance on PDS supplies. The finding supports the importance of PDS in influencing positive food security outcomes in the households (Table 22).

Table 22 Food insecurity and utilization of public programme: 2016 (in %)

		Insufficient	Partial	High reliance
DDS	Low	62.5	58.8	30.4
	Medium	21.3	16.9	49.9
	High	16.3	24.3	14.8
FFS	Low	43.8	27.1	17.1
	Medium	36.3	43.3	51.4
	High	15.0	20.6	38.5
RDA	Calorie deprived	48.8	43.9	43.0
	Protein deprived	39.8	30.2	26.8
	Fat deprived	55.5	42.8	32.4

Source IHD-Bihar longitudinal survey, 2016

Note High reliance: PDS supplies supports more than 2–3 weeks of food grains requirement; Partial: PDS supports more than 2 weeks of food grains requirement; and Insufficient: PDS has insignificant contribution due to irregular supply

5 Impact of COVID-19 on Household Food Security

This section is based on a telephonic survey conducted from November 2020 to February 2021 to understand the impact of COVID-19 on households' food security in rural Bihar. The surveyed households were part of households that were surveyed in 2016.

It has been found that the households reallocated expenditure from non-essential to essential items during the COVID-19 outbreak. The share of non-food expenditure has declined, whereas essential items like food have gained in their share in total expenditure. Figure 11 shows that the share of food consumption expenditure has increased from 53 per cent in 2016 to 71 per cent in 2021 showing an 18 percentage point increase, whereas the share of non-food consumption expenditure reduced by 18 percentage points (47 per cent in 2016 to 29 per cent in 2021).

Figure 12 shows the changes in the consumption of various food items before and during the COVID-19 outbreak. There is a significant decline in the percentage of households that consume vegetables, pulses, meat, and sweets, during COVID-19. During the same period, the percentage of households consuming roots and tuber and eggs has increased. The highest level of consumption was cereals in both periods.

The DDS has been estimated for panel households for both points of time (2016 and 2021). Figure 13 shows that the percentage of households in the low DDS has reduced from 45 per cent in 2016 to 26 per cent in 2021, whereas the medium DDS has increased by about 25 percentage points in 2021 compared to 2016. On the other hand, the proportion of households in the high DDS has reduced from 23 per cent to 17 per cent—a reduction of 6 percentage points.

As shown in Fig. 14, in about a third of the households (33 per cent), adults had low levels of food frequency scores in 2016 which reduced to 12 per cent in 2021. Similarly, 33 per cent of households' children had low levels of FFS in 2016 which reduced to 22.4 per cent in 2020. On the other hand, in about one-third of households, the adult had a high FFS in 2016 which reduced by 4 percentage points, while in about a third of households, where the child had a high FFS in 2016, it reduced by about 7 percentage points. Over the period among the households, the adult and

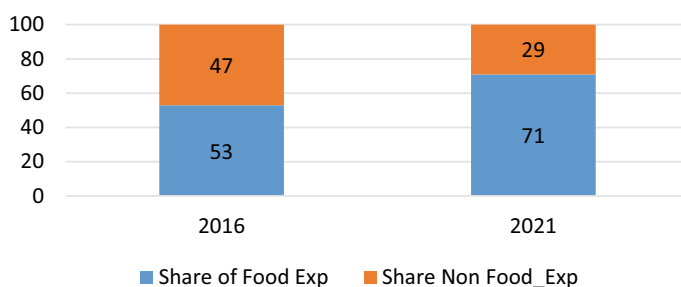


Fig. 11 Changes in share of food and non-food consumption expenditure, 2016–2021 (%). *Source* IHD-Bihar longitudinal survey, 2016, 2021

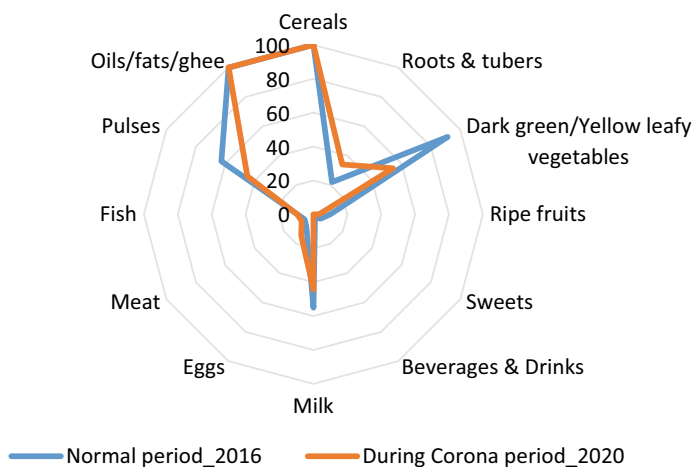


Fig. 12 Percentage of households consumed each food group in 2016 and during COVID-19. *Source* IHD-Bihar longitudinal survey 2016, 2021

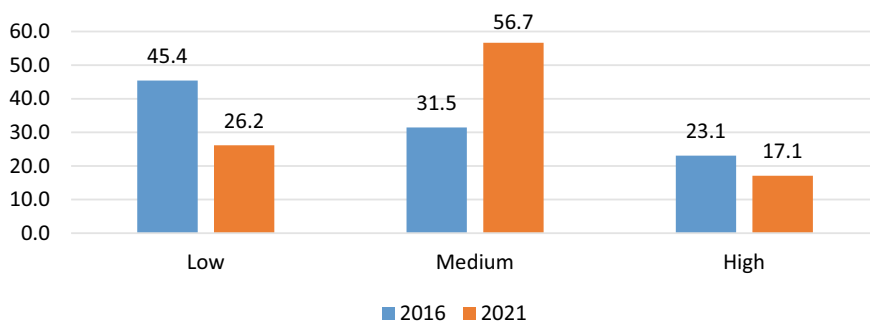


Fig. 13 HHDS in 2016 and 2021 (in %). *Source* IHD-Bihar longitudinal survey, 2016, 2021

child who stayed in the middle FFS have increased by 25 percentage points and 17 percentage points, respectively.

Table 23 highlights the food insecurity situation of the households before and during the COVID-19 outbreak. The upper part of this table presents the households' self-perception on food insecurity which is derived from the 8 items of the HFIES module of the households. It is obvious that food insecurity has worsened during the period of pandemics compared to a normal period. For instance, during COVID-19 more than half of the respondents were worried about the household not having enough food. Approximately 60 per cent of the households also worried about not being able to eat a variety of food during COVID-19. However, approximately one-fifth of the households faced these problems in the normal period also. Further, one-fourth of the households only consumed a few items of food during the COVID-19 pandemic as against only 11 per cent of such households in the normal period.

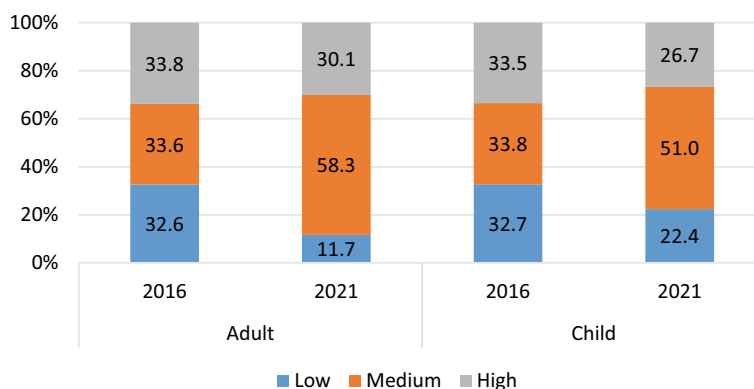


Fig. 14 FFS among adults and children in 2016 and 2021 (in %). *Source* IHD-Bihar longitudinal survey, 2016, 2021

Table 23 Food security situation before and during COVID-19 period (in %)

Items of HFIES	2016	2021	P value
Worried that household would not have enough food	18.00	56.90	0.002
Not able to eat a variety of food	16.43	58.36	0.001
Ate only a few kinds of food items	10.64	25.00	0.000
Skipped a meal	1.00	12.00	0.02
Ate less amount of food	8.00	44.00	0.000
Felt hungry	2.00	10.70	0.01
Without eating the whole day	1.00	5.34	0.001
<i>Food insecurity status</i>			
Mild food insecure	38	20.00	0.000
Moderately food insecure	39	45.00	0.01
Severely food insecure	23	35.00	0.000

Source IHD-Bihar longitudinal survey, 2016, 2021

The lower part of Table 23 shows the result of the 3 food insecurity measures that were constructed from the above 7 items of HFIES module. Compared to the normal period, the percentage of moderately insecure households increased by 6 percentage points from 39 per cent in 2016 to 45 per cent in 2021. The percentage of severely insecure households also increased by 12 percentage points from 23 per cent in 2016 to 35 per cent in 2021. However, during the same period the percentage of households with mild insecure reduced by 18 percentage points.

As mentioned earlier, migration is an important source of livelihood strategy for households in rural Bihar. About 63 per cent of households had at least one migrant worker in 2021. It is observed that 92 per cent of migrant workers were being affected by COVID. As such it is important to see whether the food security of the

migrant households got affected during COVID-19. Table 24 shows that percentage of households consuming less than 3 food groups is higher among non-migrant households in both periods. Between 2016 and 2021, there is an 11 percentage point decline among households belonging to high DDS (more than 6 food items) among migrant households. However, the proportion of non-migrant households belonging to high DDS remained the same in both 2016 and 2021. The shortage of food and lesser variety of availability of food are the major sources of worry among migrant households than non-migrant households in 2021. However, in 2016 the proportion of households that were worried about food shortage and less variety of food was much higher among non-migrant households than migrant households. Overall, COVID-19 adversely affected migrant households much more than non-migrant households (Table 25).

Table 24 Changes in dietary diversity among migrant and non-migrant households (in %): 2016–2021

	2016			2021		
	Low	Medium	High	Low	Medium	High
Migrants	42.3	30.8	26.8	25.1	59.1	15.8
Non-migrants	50.3	32.4	17.3	27.2	54.4	18.4

Source IHD-Bihar longitudinal survey, 2016, 2021

Table 25 Changes in self-perception about food security among migrant and non-migrant households (in %): 2016–2021

Items of HFIES	2016		2021	
	Migrant	Non-migrant	Migrant	Non-migrant
Worried that household would not have enough food	14.0	22.0	58.6	51.5
Not able to eat a variety of food	12.0	20.0	62.0	54.0
Ate only a few kinds of food items	9.0	11.0	32.0	20.0
Skipped a meal	1.0	1.0	17.0	8.1
Ate less amount of food	8.0	9.0	48.0	39.0
Felt hungry	2.0	2.0	11.4	9.8
Without eating the whole day	0.0	1	6.2	3.9

Source IHD-Bihar longitudinal survey, 2016, 2021

5.1 Effectiveness of the Government Programme in Supplementing Food and Nutrition Shortages During COVID-19

Respondents were also asked whether PDS foodgrains had enabled the households to mitigate the risk of food shortage during the pandemic. Figure 15 shows that 21.8 per cent of the households do not have ration cards and therefore they did not receive any ration from PDS in both periods. Compared to the normal period, the PDS ration supported the households to tide over the difficulties of life in a much decent way. Two-fifths of the households responded that the PDS ration only fulfilled less than 2 weeks of ration in the pre-COVID period. However, one-fourth of the respondents told that during the COVID period, the PDS ration supported more than 3 weeks of requirements, and another 36 per cent of the respondents reported that rations were enough to meet 2–3 weeks of requirements.

The respondents were also asked to what extent Take Home Ration (THR) from Anganwadi Centre (AWC) supported the nutrition requirements of the child. Figure 16 shows that there is a worsening in the nutrition support from AWC during the post-COVID period. More than one-third of the respondents reported that in the pre-COVID period, THR supported the child's food intake by giving him more than half of the food the child consumed daily; and an additional 45 per cent reported THR supported the child's food intake by supplying him only light meals, whereas 82 per cent of the respondents reported that in the post-COVID period, THR supported an insignificant portion of the child's normal dietary requirements due to its irregular supply.

Mid-Day Meal Scheme plays an important role in improving the nutritional level of primary school-going children by providing meals at timely intervals during school. In our sample, 60 per cent of the eligible beneficiaries received the mid-day meal as scheduled during COVID. Of those who received mid-day meals timely, 79 per cent have received it only sometimes, 17 per cent of them received it only rarely,

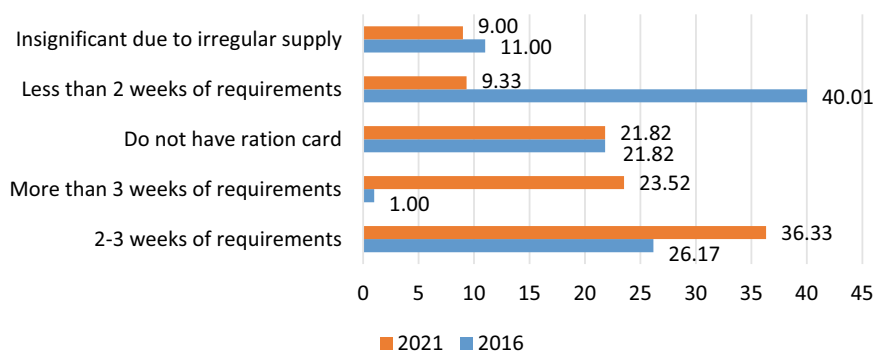


Fig. 15 PDS support during COVID-19 outbreak (in %). *Source* IHD-Bihar longitudinal survey, 2016, 2021

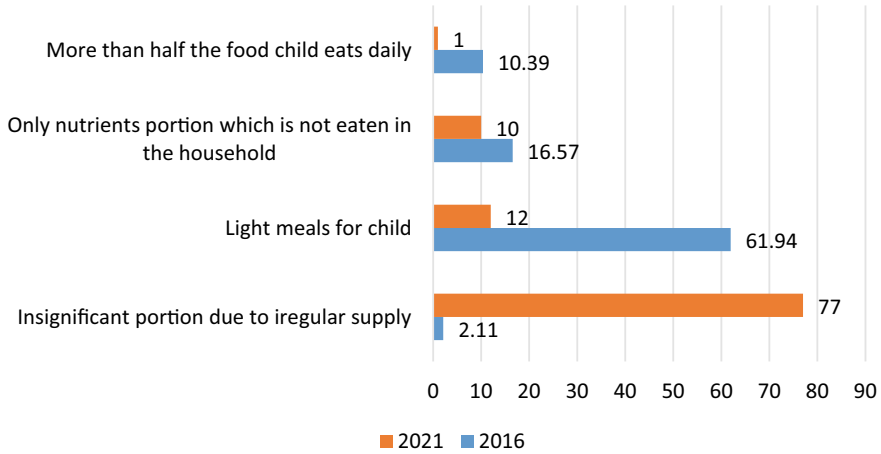


Fig. 16 THR from AWC supports during COVID-19 Outbreak (in %). *Source* IHD-Bihar longitudinal survey, 2016, 2021

and the rest of them received it regularly. However, 77 per cent of them opined that Mid-Day meals supported an insignificant portion of child nutrition due to its irregularity in scheduled distribution. However, the majority of the respondents reported that Mid-Day meals were used to support the food requirements of the child to the extent of light meals for the child in the pre-COVID period (Fig. 17).

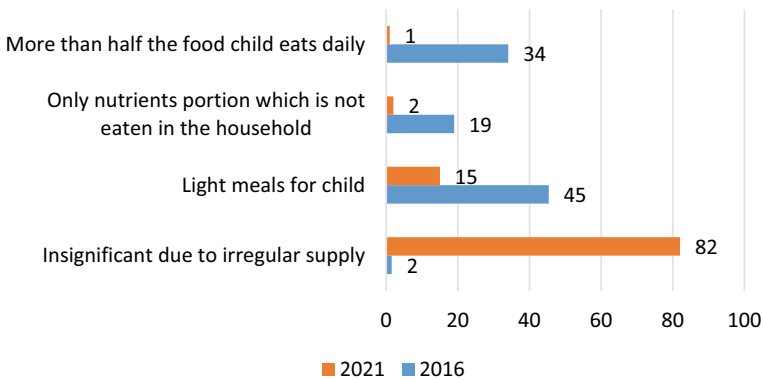


Fig. 17 Mid-day meal supports during the COVID-19 outbreak (in %). *Source* IHD-Bihar longitudinal survey, 2016, 2021

6 Conclusions and Policy Pointers

6.1 *By Way of Conclusion*

The analyses in the paper show that there has been significant improvement in the various dimensions of food security in rural Bihar, over time, more so during the 18 years period between 1998 and 2016. They are reflected in an increase in per capita consumption expenditure. Over time there has been an increase in the share of all the food items at the cost of cereals which indicates improvement in food quality. This is accompanied by the increase in per capita per day calorie, protein, and fat consumption. Notwithstanding these improvements, the consumption pattern is mostly dominated by staples, which put them at a clearly nutritional disadvantage. Nearly 40% of the households are deprived in terms of required calorie consumption, 35% are deprived of required protein consumption, and almost half of the households are deprived in terms of required fat consumption. Households predominantly depend on cereals and vegetables to meet their energy and nutrient requirements, with relatively low consumption of other food items such as pulses, fruits, edible oils, milk, and other protein-rich food items. Not surprisingly, over one-third of the households have low dietary diversity, i.e. they manage to consume only 4 food groups out of 12 food groups. Thus, in spite of improvement over time, a large proportion of households in rural Bihar do not have a balanced diet in terms of nutritional requirements. This is also reflected in the high incidence of undernutrition among children and anaemia among women as revealed by NFHS-5.

The analysis also shows that the improvements in some food indicators have been more among poorer socio-economic groups as compared to relatively richer groups. But again, the improvements among the poorer groups have been led by the consumption of staple food items. The poorer groups lag behind considerably in the consumption of protein-rich food items. The dietary diversity is also considerably lower among the poorer groups. Thus, food security in rural Bihar has clearly a class dimension.

Migration has clearly played an important role in improving the food security of the rural population. Migrant households as a whole have experienced a relatively larger increase in consumption expenditure, particularly food expenditure, than non-migrant households. Over three-fifths of the rural households in Bihar are migrants which invariably receive remittances. This contributes significantly to improving their access to food and other non-food items. This is also evident from the fact that during COVID-19 food security situation deteriorated largely because of disruption in migration and consequent remittances.

Public Distribution System (PDS) has proved to be an important pillar in improving food security. The households with higher reliance on PDS supplies have better diet diversity as well as food frequency. During the COVID-19 pandemic, PDS played an important role in monitoring households' food security. Along with PDS, Mid-Day Meal scheme and ICDS have contributed to better access of children to food and nutrition security.

6.2 Some Policy Pointers

The findings of the study have some obvious policy implications. Some of the important policy points are

- The diversification of food baskets towards nutritious food will play a very important role in enhancing food security. As revealed by the analysis in this paper, in spite of improvement in food security, the consumption pattern of a majority of the rural households is dominated by staple food items. And there is clearly a need of expanding the food basket.
- Cropping pattern in Bihar is overwhelmingly dominated by cereals. There should be a policy focus to shift this cropping pattern, even by a small margin, to other food items (oil seeds, vegetables, etc.). Millets occupy a very small area in cultivation in Bihar which can easily be increased both in Kharif and Rabi seasons, particularly the latter.
- The practice of creating a small kitchen garden can greatly help in maintaining the basic dietary diversity of the households. A major constraint is that almost three-fifths of the rural households in Bihar are landless and generally they do not have even a small parcel of land for kitchen gardens. The government may devise a policy to purchase land from the market to distribute small parcels of land to the poor households at a subsidized rate for kitchen gardens wherever possible. The practice of community kitchen gardens can also be encouraged.
- There is significant scope in further strengthening PDS. Many of the households even though eligible do not have access to PDS. This exclusion error must be eliminated. Further, the pulses, millets, edible oils, etc. should gradually comprise part of the PDS which will significantly increase the access of poor households to these items. The Mid-Day Meal Scheme and ICDS have also contributed to food security, but there is scope for much improvement in their functioning.
- Along with the above measures, the water and sanitation situation must be improved to make a frontal attack on malnutrition. Anganwadi and Aasha workers along with Primary Health Centres can play a very important role in providing these services. Anganwadi centres are in a generally bad condition, and they have not been given the attention they deserve in enhancing nutrition and food security in Bihar.

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