

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 772-777

Received: 25-03-2026
Accepted: 27-04-2026

Indexed Journal
Peer Reviewed Journal

Assessment of aggregate household food security index (AHFSI) among economically vulnerable sections of Lucknow district, Uttar Pradesh

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6j.3773>

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Abstract

In India, food security remains an unfulfilled dream for about 179, 6 million people according to World Bank, 2014. The incidence of food poverty is higher in rural areas (33.8%), than in urban areas (20.9%). In India, per capita calories intake has been improved from 2047 k. cal/day in rural areas and 2,020 k. cal/day in urban areas in 2004-05 to 2,099 k cal/day in rural areas and 2,058 k. cal/day in urban areas in 2011-12 according to National Sample Survey Office's (NSSO), 2011-12. The imports of cereals and pulses has come down in the first few years of the new millennium along with exports, although export of rice has gone up during 2005-2006. Low imports and the cautious approach with regard to export is a positive sign with regard to domestic availability of food grains. Maintaining a buffer stock is a must for ensuring self-sufficiency at all times since the margin between buffer and actual stock held has been reducing considerably. The present study was undertaken in Lucknow district of Uttar Pradesh. In the study area the value of AHFSI estimated was 79.04, which is between 75 and 85 and shows that there is sufficient level of food security in our target area. Based on the findings, the study suggests suitable policy measures and targeted interventions to enhance income stability, social protection, and sustainable livelihood opportunities for improving overall livelihood security.

Keywords: Exports, food stability, income stability, livelihood security, interventions

Introduction

The National Food Security Act, 2013, was enacted on September 10, 2013 with the intention of ensuring access to sufficient quantities of high-quality food at reasonable prices to people in order to enable them to live dignified lives. By allowing up to 75% of rural and up to 50% of urban residents to receive discounted foodgrains through the Targeted Public Distribution System (TPDS), the Act effectively covers two-thirds of the population. Each month, the eligible individuals are entitled to obtain 5 kg of foodgrains at discounted rates of Rs. 3/2/1 per kg for rice, wheat, and coarse grains respectively. The current Antyodaya Anna Yojana (AAY) households, which represent the most impoverished people, will continue to receive 35 kg of food per family each month. The Act is particularly concerned with providing women and children with nutritional assistance. In addition to meals provided to expectant mothers and nursing mothers throughout their pregnancies and for six months following childbirth, these women are also eligible to maternity benefits worth at least Rs. 6,000. Meals that meet the required nutritional requirements must be provided to children up to the age of 14. Beneficiaries would receive food security stipend in the event that they are not provided with the appropriate food or meals. The Act also includes guidelines for establishing complaints procedures at the District and State levels. For ensuring accountability and transparency, separate provisions have also been established in the Act.

Salient features of the bill include

- The All Antyodaya Anna Yojana (AAY), or poorest of the poor group, would be a priority group to receive 7 kg of subsidised foodgrains per individual per month, or 35 kg of foodgrains/family/month. There would be a minimum monthly allowance of 3 kg for general families. The measure will cover up to 75% of rural residents and up to 50% of city residents. At least 46% of the people in rural areas and 28% in urban areas would be deemed priority households. The remaining ones would serve as regular households.
- Meals and maternity benefits of at least Rs. 6000 to be provided to expectant moms and nursing mothers. However, it would be limited to just two kids.
- For the purpose of issuing ration cards, the oldest woman in the family who is 18 years old or older would serve as the head of the household.
- The cost per kg for rice, wheat, and coarse grains was Rs. 3, Rs. 2, and Rs. 1, respectively for all recipients. After the first three years, these rates would be subjected to revisions up to the minimum support price (assured price paid by the Centre to farmers at the time it buys grains from them).

A brief overview of vulnerability

According to World Bank figures, there are 176 million

people in India who are extremely poor. It also suggested that COVID-19 risk was higher in families with lower incomes. Additionally, these were the people who were most vulnerable to food insecurity. On the upper end, one may look to the figures given by the 2019 Multidimensional Poverty Index (MPI), which estimated that there are 369 million poor people in India. Sources like the Global Hunger Index (GHI), which places India poorly, particularly in terms of child stunting and child wasting, provided more insight into the other aspects of food security issues. Similarly, pregnant women and girls were designated as being particularly vulnerable to food insecurity at any given time. Landless workers in rural regions and migrant workers in urban areas both need assistance with food security. A category of individuals in need of support might also be created by the type of employment and pay scale. These figures make it easier to understand the size of the challenge that a nation like India confronts even in non-emergency situations. The challenge got worsened in a novel scenario like the COVID-19 outbreak. The possibility of a loss of income for self-employed people and temporary employees during the lockdown is an important consideration in this situation.

Research methodology

The study was carried out purposively in selected one district i.e., Lucknow in U.P. Out of 75 districts in Uttar Pradesh, Lucknow district was purposively selected as it is the capital and major district of Uttar Pradesh and earlier no study had been done on the weaker sections of the society in the selected area.

Table 1: Description of Lucknow District, Uttar Pradesh

Geographical area	2528 sq Km
Population	51.47 lakh
Population density	1816 per sq Km
Literacy rate	77.29%
Sex ratio	909:1000
Development blocks	08
Talukas(Tehsil)	04
Panchayats	511
Total villages	807
Total cultivated area	215280 ha
Net cultivated area	138148 ha
Net irrigated area	124000 ha
Small & Marginal Farmers	92.9% of total population
Average Land holding of Small & Marginal Farmers	0.8 ha
Cropping intensity	158 %

Source: Krishi Vigyan Kendra, Lucknow

There are total 9 blocks in district Lucknow (UP). Among these, 2 blocks were selected purposively based on the higher area under weaker sections of the population. Two blocks were selected through simple random method. The blocks selected for study were Bakshi ka talab and Itaunja block.

There are 185 villages in Bakshi ka Talab block. Three percent of the villages from Bakshi ka Talab block were selected randomly. Itaunja block has total 112 villages and 5 percent villages were selected from this block for the study randomly on the basis of higher number of weaker sections.

A list of all the respondents involved in the selected villages was prepared. Further these respondents were arranged in ascending order on the basis of their poverty level and was divided into three groups viz. BPL (Below Poverty Line) cards, APL (Above Poverty Line) cards and AAY (Antyodaya ration Card) during 2021-22. Out of the total respondents, 10% respondents in each village were selected randomly. The primary data was collected from the

respondents through personal interview with the help of interview schedule. The relevant secondary data was collected from various sources, i.e. books, journals, reports and records of district and block headquarters. The study was carried out during the period 2021-2022.

Analytical tools and techniques

Aggregate household food security index (AHFSI)

To investigate household food security, primary data was collected from the study area. To estimate the household food security, study was confined to primary data collected from the study area. The reason for selecting this area was the vulnerability of people towards food security in this area. Collection and analysis of data was done. Aggregate Household Food Security Index (AHFSI) was used to measure the household level of food security. AHFSI is an indicator of per capita food availability for human consumption. Food balance sheets were used to know about the consumption pattern and availability of calories to the respondents. The formula for the Aggregate household food security index is

$$AHFSI = 100 - \frac{[H \{G + (1-G) I^P\} + 0.5 \Omega \{1-H [G-(1-G) I^P\}]}{100} \quad \text{(Thomson \& Metz, 1997)}$$

Where, H is head count of proportion of the total population undernourished. The value of H was found by calculating Body Mass Index (BMI), the index is calculated by dividing weight (W) measured in kilograms by height (H) squared measured in meters.

$$BMI = \frac{W}{H^2}$$

Depending upon the degree of under-nutrition or obesity of the subject, the BMI can take values between 15 and 40. For this purpose, following classification has been proposed:

BMI Below 16 Severe chronic malnutrition 16- 17.5 Chronic malnutrition with wasting 17-18.5 Chronic malnutrition with underweight 18.5-25 Normal 25-30 Overweight Over 30 Obese According to BMI, the people having index less than 18.5, was considered undernourished.

G is a measure of extent of the food gap of the average undernourished shortfall in dietary energy supplies from national average requirements for dietary energy. National average requirements was considered to be equal to 1. The extent of food gap was measured by taking undernourished shortfall as a proportion of national average requirements.

I^P is a measure of inequality in the distribution of individual food gaps of the undernourished, based on the Gini-coefficient. Gini-coefficient was calculated by drawing Lorenz Curve. To draw the Lorenz Curve, the calories availability to the sample individuals was arranged in ascending order and deciles was made. The total calories availability to the individuals was calculated and percentage availability of calories to every decile was determined. The deciles of population and calories availability in cumulative percentages was used to construct the Lorenz Curve. The percentages of the population was plotted on horizontal axis and percentage of food availability in calories was plotted at vertical axis. The entire figure was enclosed in a square and a diagonal line was drawn from the lower left corner of the square to the upper right corner.

That diagonal line acted as line of equality. The Gini-coefficient was determined by the formula.

Gini – coefficient

$$= \frac{\text{Area between line of equality \& Lorenz Curve}}{\text{Total area under line of equality (a triangle area)}}$$

(Todaro, 1997)

Ω is the coefficient of variation in dietary energy supplies, which gives the probability of facing temporary food shortage.

The formula for the coefficient of variation is

$$\text{Coefficient of variation} = \frac{S.D}{\bar{X}} \times 100$$

Where,

S. D = Standard deviation

$\bar{X}$ = Arithmetic Mean

So, the values of four variables of AHFSI was calculated and by putting these values, the AHFSI was calculated. The value of this index ranges from 100, which represents complete, risk-free food security, to zero which would represent presumably total famine.

Results and discussion

Aggregate household food security index (AHFSI)

For H value, the BMI of 50 households or 300 individuals was calculated. Out of 300, 64 individuals were found undernourished. The results of BMI shows that 21% population was undernourished and, if we consider, the total population equal to 1, then the undernourished population will be 0.21, which is value of H.

To estimate G value, food consumption survey was undertaken. The caloric intake of 300 individuals was

calculated with the help of food balance sheets. Then average caloric intake of 64 undernourished individuals was calculated, which was 1726.18 k. Cal. / day individual. The national average caloric requirement for India is 2459 k. Cal. / capita / day (FAO, 2011). So, the gap between average requirement and average availability was 29.8%. if the average requirement is considered equal to 1, then the gap will be 0.298 and average availability of food for consumption will be 0.70.

IP - is a measure of inequality in the distribution of individual food gaps of the undernourished, based on the Gini-coefficient, it was necessary to arrange all the individuals with ascending i.e., 300/10=30 individuals in each decile. 30 individuals compose the lowest decile or 20% of total caloric intake and the population was divided into successive deciles according to the ascending order of food intake, then the proportion of total food intake by each group was determined.

Table 2: Percentage food intake by percentage of population (in deciles) of target area

Percentage of population	Caloric intake (k. Cal. / day)	Percentage of total caloric intake of 150 individuals	Cumulative percentage of total caloric intake of 150 individuals
10	35647	7.075	7.075
20	40901	7.996	14.071
30	44335	8.598	21.669
40	50305	9.645	30.314
50	57434	10.895	40.209
60	60403	11.416	50.625
70	63027	11.876	61.501
80	69767	13.058	73.559
90	74871	13.953	86.512
100	83585	15.481	100.00

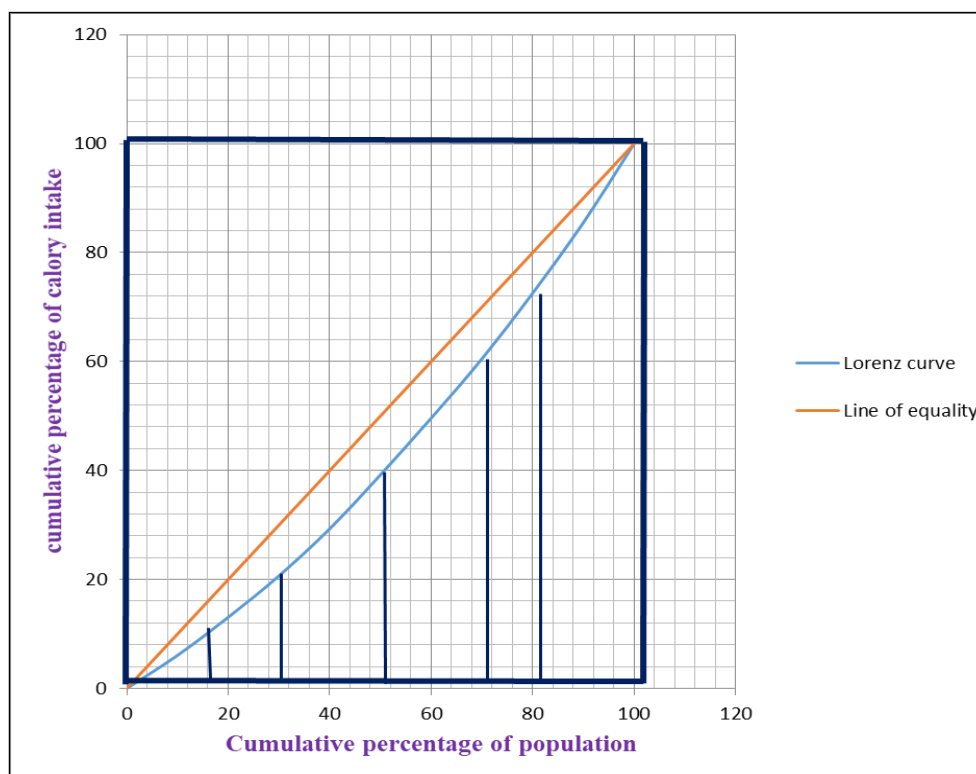


Fig 1: Lorenz Curve Depicting the Distribution of Income/Wealth and Inequality

The above table 2, shows the distribution of caloric intake among the different groups. On the basis of cumulative percentage Lorenz Curve was drawn. The horizontal axis shows the percentage of population and vertical axis shows the percentage of caloric intake of target area. It was cumulative up to 100% meaning that each axis was equally long. The entire figure was enclosed in a square and diagonal line was drawn from lower left corner (the origin) to the upper right corner. At every point on that diagonal the percentage of food received was exactly equal to the percentage of population. The Lorenz curve shows the actual quantitative relationships between the percentage of population and percentage of total food intake. Lorenz curve. Represents the inequality and on the basis of Lorenz curve Gini-coefficient was calculated.

Gini-coefficient. Area between line of equality and Lorenz curve/ Total area under line of equality (a triangle area).

Area between line of equality and Lorenz curve = total area of triangle $\angle BCD$ area under the Lorenz curve. So, to determine the total area of triangle angle $\angle BCD$

Area of triangle BCD = $\frac{1}{2} BC * CD$

= $\frac{1}{2} (20 * 20)$

= 200 cm²

Area under the Lorenz curve = area of triangle I + area of trapezium II + area of trapezium III + area of trapezium IV + area of trapezium V + area of trapezium VI.

So,

1. Area of triangle I = $\frac{1}{2} (h * b)$

Where, h = height

b = base

= $\frac{1}{2} * (2 * 3)$

= 3 Cm²

2. Area of trapezium II = $\frac{1}{2} * (a + b)$

Where, a = base

b = base

h = height

= $\frac{1}{2} * (2 + 4.25) * 3$

= 9.38 Cm²

3. Area of trapezium III = $\frac{1}{2} * (4.25 + 7.9) * 4$

= 24.3 Cm²

4. Area of trapezium IV = $\frac{1}{2} * (7.9 + 12.25) * 4$

= 40.3

5. Area of trapezium t = $\frac{1}{2} * (12.25 + 14) * 2$

= 26.25 Cm²

6. Area of trapezium VI = $\frac{1}{2} * (14 + 20) * 4$

= 68 Cm²

So,

Area under Lorenz curve = 3 + 9.38 + 24.3 + 40.3 + 26.25 + 68

= 171.23Cm²

Area between line of equality and Lorenz curve = under the Lorenz curve = area of triangle BCD area

= 200-171.23

= 28.77Cm²

Gini coefficient = Area between line of equality and Lorenz curve / Total area under line of equality (a triangle area)

Gini – coefficient = 28.77/200

= **0.144**

Ω - Is the coefficient of variation in dietary energy supplies, which gives the probability of facing temporary food shortage? The formula for coefficient of variation is

$$\Omega = \frac{SD}{Mean} * 100$$

So,

$$X^- = \frac{570275}{300}$$

= 1900.9166

Formula for SD is

$$SD = \sqrt{\sum X^2 - \frac{(\sum X)^2}{300}}$$

= 465.3719

$$\Omega = \frac{465.3719}{1900.9166} * 100$$

= 26.05 %

The value of all four variables had been calculated. These values are shown as following:

H-0.213

G-0.298

I-0.144

Ω -0.260

By putting the above values in AHFSI formula:

A H F S I = 100 - [H { G + (1 - G) I^P } + 0.5 Ω { 1-H (G-(I - G) I^P) }] 100

= 100 - [0.213 { 0.298 + (1-0.298) 0.144 } + 0.5*0.260 { 1- 0.213 [0.298-(1-0.298) 0.144] }] 100

A H F S I = 79.0447

Table 3: The following classification has been proposed by FAO: -

CATEGORIES	
Less than 65	Critical level of food security
Between 65 and 75	Low level of food security
Between 75 and 85	Sufficient level of food security
Above 85	High level of food security

So, the value of AHFSI is 79.04, which is between 75 and 85 and shows that there is sufficient level of food security in our target area.

Impact of NFS Act on poor household

The observed trend of declining poverty rates in Lucknow during the past decades reveals better economic conditions enjoyed by the poor population. However, food insecurity still hovered at a high rate in 2014-15. If the income poverty indicator showed that poverty had been reduced, it was surprising to note that this improvement had not trickled down to affect food security for poor's. While food consumption in Lucknow was at a high level, it was also heavily dependent on subsistence food in 2014/15. Poor heavily on their own production of basic food staples such as rice, wheat and potato, all of which provide an excess of carbohydrate consumption resulting in a protein- and fat-

deficient diet. These deficiencies have an impact on the health status of the poor population, particularly for those living in the rural areas, which lack adequate health services. The risk to food security in Lucknow arises more from fluctuations in food production rather than from income or food price increases because very little of what poor consume is purchased. In estimating food inadequacy, a suite of indicators was derived to capture all the dimensions of the four main pillars of food security, which relate to policies of poverty reduction. The food security indicators are useful for determining the causes of hunger, which, in turn, help to identify

Constraints and priorities for policies. From the gender perspective, it was concluded that Itaunja was more food secure than Bakshi ka Talab in Lucknow.

Dietary energy consumption (DEC)

DEC declined over the period from 1987/88 to 2004/05. The daily DEC of an average Indian was 2 217 kcal in 1987/88 and dropped to 2 042 kcal in 2004/05, thereby registering a reduction of 175 kcal (9.9 percent) during that period. DEC among rural households was higher than the national level, and then that of urban households. This result was due mainly to the high consumption of food grains, which are rich in dietary energy, in rural areas. Figure 2.1 shows the declining trend of DEC from 1987/88 to 2004/05. The downward trend among rural households was more pronounced than that of urban areas because the DEC gap between these two areas decreased from 152 kcal to 21 kcal from 1987/88 to 2004/05. It was important to note that the DEC was converging to an average daily consumption of about 2045 kcal per person.

Summary and conclusion

Food security is an issue of significant importance for a country like India where still a high proportion of people are reported below poverty line & malnourishment & hunger is still widely prevalent. The need for food security and the awareness & consciousness about the right to food has been growing over the years with efforts from various quarters (ranging from the Right to Food Campaign to the Food Security Atlas and Sustainability of Food Security Atlases being released etc.) making us more conscious of the fact that maintaining food security is important and it is nothing but human security in the long run. For ascertaining whether a state is food secure or not, certain aspects or parameters have to be considered. These are food availability, accessibility and food absorption. Along with these three that tell us about the current food security situation, sustainability of food security is equally important for the long term. Also, one has to place the aspect of food security in the context of rural development as it helps in improving all aspects of food security i.e., schemes on food-based programmers and programmes for development of natural resources, poverty alleviation and employment generating programmes along with development of rural infrastructure, provision of nutritional programmes, better health, water supply and sanitation facilities. Rural development is crucial for achieving a food secure India. States have objected to the policies catering to the WTO rules and institutions and have questioned the impact of these policies specially on the important sectors, one of them being agriculture, with the bone of contention being the fact that agriculture is a state

subject & me states have challenged the legality of the Government of India's actions at the WTO without consulting them. Also, concerns have been raised that Agreement on Agriculture with international trade & cutting down of domestic support should not be at the expense of self-sufficiency in agricultural commodities nor at the expense of food & livelihood security. It is seen that many a times a policy decision taken by the Centre can have repercussions for the states as they get to feel the brunt of its impact. This has happened with agriculture & through agriculture to the food security situation.

The Aggregate Household Food Security Index (AHFSI) revealed that a large proportion of households belonging to the weaker sections had moderate to low food security. Although government support measures (such as subsidized food grains) improved food availability, issues related to economic access, dietary diversity, and nutritional adequacy persisted. Overall, the AHFSI results indicate that while basic food security has improved, complete and sustainable household food security among weaker sections has not yet been fully achieved.

The AHFSI results indicate that the weaker sections have low to moderate household food security, reflecting continued dependence on public support systems and vulnerability to income and price fluctuations.

Suggestions

Streamlining procurement, storage and supply-chain management system to make sure food commodities are available at all locations, especially at potential hunger hotspots.

- Refining the delivery and distribution system so as not to deprive anyone of food for instance, sometimes not having a ration card or ID proof has barred households from accessing welfare measures.
- Allocating cash subsidies for families to be able to purchase other essential items. The MDMS might also need a revamping. Mid-day meals to be provided to children irrespective of the assumption that the family is earning and getting food from other sources. Also, the government could step up the cash contributions made to families in need.

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