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Food Security and Undernourishment in India: Assessment of Alternative Norms and the Income Effect*

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I

INTRODUCTION

Food and nutrition security has remained one of the top priorities of policy planners in post-Independent India. The country followed a multi-pronged strategy to improve and sustain food and nutrition security. The core objective of this strategy has been to sustain and improve food and nutrition security through food self-sufficiency. The strategy includes (i) strong support for raising food production, (ii) stable supply of some food staples and (iii) making food available at affordable prices. This strategy embraces several instruments that cover generation and adoption of technology, better availability of inputs, institutional credit, subsidy on farm inputs, improved infrastructure, expansion of irrigation, institutional reforms and mechanisms, competitive markets, remunerative prices for farmers/producers, public procurement, system of buffer stocks, open market sales, supply of food through public distribution system, nutrition interventions and trade policy.

This strategy has helped India in several ways. Food production[1] including livestock products and fish increased from 188 million tonnes (MT) during 1970-71 to 342 MT during 1990-91 showing an 82 per cent increase over two decades. In the next two decades, food production increased to close to 600 MT- marking a 75 per cent increase. In these two periods, the population of the country increased by 53 and 47 per cent, respectively. This has resulted in an increase in per capita production of total food from less than 350kg per person during the early 1970s to more than 500 kg in recent years. However, the effect of increase in per capita production of food recorded in the country is not visible in terms of the improvement in food and nutrition security. According to some studies based on the per person per day energy norms of 2400 Kcal for rural and 2100 Kcal for urban areas, there is deterioration in the prevalence of undernourishment based on energy intake during 1987-88 to 2004-05 (Deaton and Dreze, 2009). About 40 per cent children under age of 5 years are underweight and child mortality is also high. Based on such facts, serious questions are now being raised about the country's achievements in food security. This

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situation has been persisting even when large surplus of grains have been lying in public buffer stock and a part of it is shown to be rotting here and there for want of proper storage and maintenance. Correspondingly, India's export of food products have been growing and the country exports a sizable quantity of cereal and livestock products.

Another disturbing factor related to nutritional deprivation in India is that income poverty and prevalence of under nutrition are not moving in the same direction despite the fact that the poverty lines were initially associated with a caloric norm. It is somewhat puzzling as to why despite a substantial increase in per capita food production and significant decline in poverty India continues to face high incidence of under nutrition and malnutrition. India's progress in improving nutrition has been excessively slow regardless of its rapid growth in income over the past two decades. It, therefore, becomes important to distinguish between those who are undernourished because of poverty and those who are not poor but are still undernourished. This has strong implications for addressing the problem of hunger and malnutrition.

A related aspect is the significant difference in the prevalence of undernutrition based on alternative norms based on National Sample Survey Office (NSSO) data and those based on supply-side data as reported by the Food and Agriculture Organization (FAO) of United Nations. The NSSO's household-level Consumer Expenditure Survey (CES) studies have shown that three-fourth of India's population suffers from undernutrition (Deaton and Dreze, 2009) – as they consume less than the minimum dietary energy as per the norm of 2400 Kcal for rural areas and 2100 Kcal for urban areas in 2004-05. On the contrary, as per the FAO only one-fifth of population of India was undernourished during 2004-06, which further declined to 17.5 per cent during the period 2010-12. According to the latest Global Hunger Index 2012, India's track record in dealing with hunger has been disappointing. The country's index value has improved but it still remains among countries with an "alarming" level of hunger. All the other countries in the BRICS (Brazil, Russia, China and South Africa) grouping have performed better than India in dealing with hunger. Surprisingly, the NSSO's CES-based studies and FAO estimate not only show wide divergence they also moved in the opposite direction with regard to the temporal direction of caloric poverty.

Given the significance of identifying absolute numbers and identity of the food-insecure, we address the following key questions:

(i) what is the current status of undernutrition and malnutrition in India,

(ii) what is the incidence of hunger among poor and non-poor households based on different norms,

(iii) are high food prices always adverse for food and nutrition security, and

(iv) why FAO's estimate of prevalence of hunger is far lower than the other estimates and if it has some limitations.

We have also attempted to explain the "paradox of hunger amidst plenty" representing high levels of hunger even when India's granaries are overflowing and the country is going for record export of various food products. The paper briefly comment on the specificity of India's dietary tradition rooted in its historical and cultural values that make it distinct from other countries, where the type of economic growth as seen in India has led to rapid dietary shift towards livestock products.

II

DATA SOURCES AND METHODOLOGY

The estimates of undernutrition (calorie deficiency) and malnutrition (protein deficiency) were prepared for various income groups using unit-level NSSO data for the latest Round (66th Round) on Consumer Expenditure for the year 2009-10. The nutrient intake of an individual was computed using the quantity of each food item consumed and the nutrient chart provided by the NSSO in its Report No. 540 on 'Nutritional Intake in India'. Further, all the outliers, i.e., observations in terms of per capita nutrient intake and monthly per capita expenditure that are most likely misreported were identified using an objective approach of blocked adaptive computationally efficient outlier nominators (BACON) algorithm as proposed by Billor, Hadi, and Velleman (Weber, 2010).The outliers, 5-6 per cent of the sample population, were detected using the BACON command in STATA and were excluded from the analysis. The quantity consumed of each of the food items by each household was converted into its nutrient equivalent content of calories and proteins. This approach assumes that no food is wasted, all the meals whether consumed at home or outside have the same nutrient composition and there is no distinction between gross calorie intake and net calorie absorption. It is also important to highlight that the actual intake of nutrients also depends on how the food items have been processed and/or cooked in the surveyed households. The meal adjustment procedure, as suggested by NSSO, was applied in the entire analysis to account for the donors and recipients of free cooked meals.

The paper mainly deals with the nutrient intakes and monthly per capita consumption expenditure (MPCE) based on the mixed reference period (MRP) wherein the expenditure on items of clothing and bedding, footwear, education, institutional medical care is recorded for a reference period of last 365 days and expenditure on all other items is recorded for the last 30 days. The entire sample population was distributed into two sub-sets: the poor households and non-poor households on the basis of the state-specific poverty lines[2] for 2009-10 as provided by the Planning Commission. The non-poor or above poverty line (APL) population was further classified into two categories: middle income and high income. The classification into middle and high income categories is done on the basis of decile classes of MPCE. The entire APL population was grouped into 10 decile classes and

top two decile classes were termed as high income group or rich class while the remaining eight decile classes were termed as middle income group.

The prevalence and levels of undernutrition and malnutrition were estimated from unit-level data in Schedule Type 1 of the 66th Round of NSSO which covers 100855 households. As was discussed in the previous section, the entire sample population was divided into two sub-sets: the poor and non-poor. Within the overall 100855 households, 21001 constitute below poverty line (BPL), 63884 APL (middle) and 15970 APL (high) category households.

Prevalence of undernutrition and malnutrition (POU) was estimated as:

$$POU = \frac{1}{N}\sum_{h=1}^{n} I_h w_h$$

where, $I_h = 1$ if $C_h < Z$ and zero otherwise; h indexes households, C_h is the per capita intake in the h-th household, Z is the pre-specified norm, n is the number of households sampled, and $N = \Sigma^{n}_{h=1} w_h$ is the estimated population; w_h is the sampling weight associated with the h-th household. In case of unit-level household data, w_h is given as the product of household-level multiplier and household size.

The prevalence of undernutrition was estimated on the basis of FAO norm as well as Indian Council of Medical Research – National Institute of Nutrition (ICMR-NIN) norm whereas the prevalence of malnutrition was estimated based on ICMR-NIN norm only. FAO uses a uniform norm of 1800 Kcal for both rural and urban areas for reporting undernutritionat global level and across countries. It is imperative to note here that this norm represents the 'minimum' amount necessary for maintaining good health as is reflected in the FAO's minimum dietary energy requirement (MDER) for sedentary activity. It also takes into account the minimum energy needs of age and sex differentiated demographic groups that are based on body weights and activity levels, which are then aggregated to arrive at a typical person's energy requirement through a population-weighted average of the age-sex groups' requirements. This, however, does not reflect the complete story as every individual's body has differential adaptation mechanisms. Nonetheless, we will not delve into the biological aspects of the debate here and focus only on the economics of it. Thus, in an attempt to capture the demographic differentials across individuals, we next use an alternative approach as proposed by Vishwanathan and Meenakshi in their paper (Vishwanathan and Meenakshi 2006). Under this approach, the demographic information as provided in the NSSO's CESs was employed. Here we first computed the household-specific norm (Z_h) instead of a pre-specified norm and compare the household level intakes (C_h) instead of per capita intakes with this norm. Here also, the sampling weight estimates the percentage of persons living in households with insufficient nutrient intakes.

The age and sex-adjusted norms used in the analysis are taken from Nutrient Requirements and Recommended Dietary Allowances for Indians (ICMR, 2009) as follows:

$$\text{Calories (rural) } Z_h = N_{0h}*593+N_{1h}*1060+N_{2h}*1350+N_{3h}*1690+N_{4h}*2190+N_{5h}*2750+N_{6h}*3020+N_{7h}*2010+N_{8h}*2330+N_{9h}*2440+N_{10h}*2730+N_{11h}*2230$$

$$\text{Calories (urban) } Z_h = N_{0h}*593+N_{1h}*1060+N_{2h}*1350+N_{3h}*1690+N_{4h}*2190+N_{5h}*2750+N_{6h}*3020+N_{7h}*2010+N_{8h}*2330+N_{9h}*2440+N_{10h}*2320+N_{11h}*1900$$

$$\text{Protein (rural/urban) } Z_h = N_{0h}*10+N_{1h}*16.7+N_{2h}*20.1+N_{3h}*29.5+N_{4h}*39.9+N_{5h}*54.3+N_{6h}*61.5+N_{7h}*40.4+N_{8h}*51.9+N_{9h}*55.5+N_{10h}*60+N_{11h}*55$$

where the variables represent the number of individuals in different sex and age groups for a given household h; N_0 represents number of children below 1 year (infants); N_1 represents number of children between 1-3 years; N_2 represents number of children between 4-6 years; N_3 represents number of children between 7-9 years; N_4 represents number of boys between 10-12 years; N_5 represents number of boys between 13-15 years; N_6 represents number of boys between 16-17 years; N_7 represents number of girls between 10-12 years; N_8 represents number of girls between 13-15 years; N_9 represents number of girls between 16-17 years; N_{10} represents number of adult males above 17 years and N_{11} represents number of adult females above 17 years.

It is to be noted that the average body weight of infants is taken as 6.9 kg. Pregnant/lactating women have been excluded from the analysis for simplification purposes as well as due to non-availability of such data. This computation uses the recommended dietary intake levels for moderate activity in rural areas and assumes sedentary lifestyles in urban areas. Even though this approach also doesn't capture the intra-household consumption distribution of individuals, but it is superior to the single norm approach as it enables us to evaluate the sensitivity of the results towards changes in the demographic structure and activity patterns of the study population.

III

LEVEL OF DIETARY INTAKE AND INCIDENCE OF UNDERNUTRITION AND MALNUTRITION

The nutritional status in India during the period 2009-10 was examined using two indicators. One by comparing the per capita dietary intake of energy and protein with their respective recommended dietary allowances (RDAs) and two, by estimating the ratio of population that consumed lower than their RDAs. The first indicator may also be called as adequacy and the second as deficiency.

Adequacy of major food nutrients, namely, calorie and protein in Indian diets can be seen from Table 1 which presents the summary statistics for the per capita daily nutrient consumption and RDAs based on ICMR-NIN norm adjusted for age, sex and activity (A,S,A) of members of a household. It is pertinent to point out here that NIN has updated and prepared new norms for RDA for Indians in 2010. These are on an average on the lower side for majority of the age-sex-activity groups as compared to the norms used by earlier studies. NIN recommends the dietary allowances for different age groups, sex groups and activity levels. Therefore, the norm varies across households depending upon age composition, sex composition and type of activity. The unit-level household data shows that dependency ratio (share of infant, children and aged in total household members) declines with rise in expenditure/income class. These demographically and activity-wise adjusted norms and actual intake of calorie and protein are presented in Table 1.

TABLE 1. DEMOGRAPHICALLY AND ACTIVITY-WISE ADJUSTED ENERGY AND PROTEIN NORMS AS PER ICMR-NIN AND ACTUAL INTAKES

Locale and expenditure class	Calorie/person/day: Kcal		Protein/person/day: gram	
	ICMR – NIN norm	Actual intake	ICMR – NIN norm	Actual intake
(1)	(2)	(3)	(4)	(5)
Rural				
Poor	2140	1755	45.84	46.41
Middle income	2268	2189	49.75	58.78
High income	2357	2572	52.61	70.08
All rural	2226	2051	48.47	54.76
Urban				
Poor	1965	1665	47.04	44.77
Middle income	2034	2014	50.54	54.33
High income	2101	2394	53.52	64.49
All urban	2022	1957	49.92	52.78
Rural+Urban	2171	2026	48.86	54.23

Source: The authors' own estimation using unit-level NSSO 2009-10 CES data.
Note: ICMR – NIN norms are adjusted for age, sex and activity.

The average per capita per day RDAs based on ICMR-NIN norm turns out to be 2226 Kcal for rural and 2022 Kcal for urban households. The RDA was lower for poor category than non-poor due to the higher concentration of children and infants in BPL households despite the higher occurrence of labourious work among poor households as compared to non-poor households. On an average, rural India faced an energy deficiency of 175 Kcal while the deficiency in urban India was only 65 Kcal. In both rural as well as urban areas, the energy deficiency was the highest in poor households. Households in the poor income category suffered from a calorie deficiency of 300 Kcal in urban areas and 385 Kcal in rural areas. The level of deficiency in middle income group was 20 Kcal in urban areas and 79 Kcal in rural areas. The average calorie intake in high income group was higher than the required norm by 9 per cent in rural areas while it was 14 per cent in urban areas.

As against the ICMR-NIN norm, which is more specific and varies according to physical activity and population composition, the FAO uses a uniform norm of 1800 Kcal as MDER for uniform sedentary activity level. The average energy intakes by the population residing in middle and high income households was found to be higher than the minimum norm prescribed by FAO. However, the average calorie intake for the BPL households was even lower than the FAO norm. Further, there are inter-household variations around the average. Thus, the exact prevalence of undernutrition can be captured by computing the number of persons living in households with consumption levels lower than their respective prescribed norms after adjusting for both demographic and activity attributes.

Protein intake in India presents a different picture than calorie intake in terms of the average intake levels. According to the ICMR – NIN approach, a minimum intake of 48.47 gram (gm) in rural and 48.86 gm in urban areas is recommended. Against this, the actual intake was found to be 54.76 gm per person per day in rural areas and 52.78 gm in urban areas. Except the urban poor, all the other households showed an average intake of protein which was more than the required minimum intake norm. However, like calorie intakes there are wide variations in protein intakes across different households. Therefore, despite the average actual intakes being higher than their average norms there are households that do not consume the minimum recommended level of protein.

Status of nutrition is consequently better revealed by the prevalence of undernutrition and malnutrition which provide estimates of proportion of people living in households that are not consuming their threshold household level intakes of energy and protein respectively. The estimates are presented in Table 2 which provide incidence of undernourishment (hunger) based on:(a) ICMR – NIN norm adjusted for age, sex and activity (A, S, A) and (b) FAO norm. Prevalence of malnourishment based on the ICMR - NIN norm is also presented in the same table.

TABLE 2. PREVALENCE OF UNDERNUTRITION AND MALNUTRITION BASED ON FAO NORM AND ICMR - NIN NORM IN VARIOUS INCOME GROUPS

Locale and expenditure class	Undernourishment (per cent)		Malnourishment (per cent)
	FAO norm	ICMR - NIN norm	ICMR - NIN norm
(1)	(2)	(3)	(4)
Rural			
Poor	56.9	82.6	50.0
Middle income	21.3	61.3	31.7
High income	7.0	39.0	14.0
All rural	32.3	67.0	36.7
Urban			
Poor	66.7	78.5	59.9
Middle income	33.7	55.2	40.8
High income	10.1	29.7	22.8
All urban	39.5	58.7	43.8
Rural+Urban	34.2	64.8	38.7

Source: Same as in Table 1.

Note: ICMR – NIN norms are A,S, A adjusted where A,S,A refer to age, sex and activity.

One-third of the population living in rural households and close to 40 per cent in urban households were found undernourished based on the FAO norm. More than half of the rural poor and two-thirds of urban poor consumed less than 1800 Kcal. One-fifth of the middle income population in rural households and one-third in urban areas consumed food that did not provide them even 1800 Kcal of energy. Amongst the high income group, prevalence of hunger was 7.0 per cent in rural and 10.1 per cent in urban households, based on FAO norm.

Prevalence of undernutrition was much higher based on the ICMR - NIN norm. Based on this norm, more than two-thirds of the population in rural households and 58.7 per cent in urban households was undernourished during 2009-10. As expected, the prevalence of hunger declined with rise in income. Caloric intake by 82.6 per cent rural poor and 78.5 per cent urban poor was below the minimum level of recommended dietary intakes. Majority of the middle income households were also suffering from energy deficiency in their diets. It needs to be emphasised that undernourishment was significant even among rich households. Food intakes by 39.0 per cent rural rich and 29.7 per cent urban rich did not meet the minimum energy requirement as per the ICMR-NIN recommendation. Prevalence of high level of undernutrition among the non-poor households indicates that the undernutrition problem cannot be addressed by addressing poverty alone.

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In total population (rural +urban), prevalence undernourishment was 34.2 per cent based on FAO norm and 65 per cent based on ICMR-NIN norm.

Prevalence of malnourishment was less severe than undernourishment (see Table 2). Further, protein deficiency was more prevalent among urban households as compared to rural households in all income categories. Half of the rural poor and about 60 per cent urban poor consumed less than their minimum required level of protein. Similarly, 31.7 per cent of the population in rural and 40.8 per cent in urban households in middle income group were afflicted with malnourishment. Among rich households more than 14.0 per cent population was found to suffer from protein deficiency.

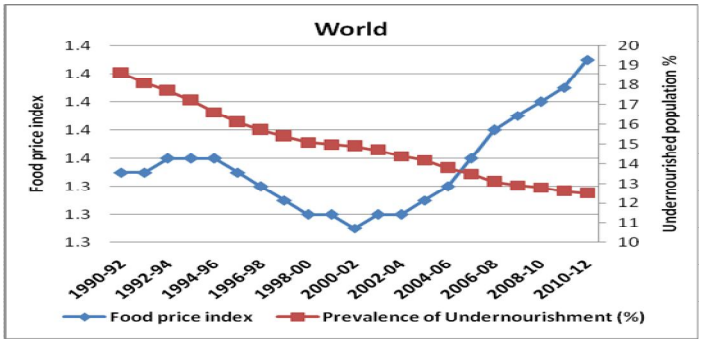
IV

PRICES AND PREVALENCE OF HUNGER

The global food prices started deviating from their past trend of three decades after 2004-05. Food prices spiked during the year 2007-08 and did not return back to the pre-2005 level. Domestic prices in majority of the countries also followed the global trend though with some time lag and different amplitudes. This phase of food price rise had caused worldwide concern and some international organisations estimated that more than 75 million people were added to the rank of hungry population due to the rise in food prices (FAO, 2008, p.6; 2009, p.2). These findings were based on the results of estimation or economic models that capture only the direct effect of price rise on food demand or consumption. However, these models did not take into account the indirect effect of increase in food supply and thus improved food availability. It might be the case that a substantial and consistent rise in food prices created a strong incentive for the producers to raise their output, which had suffered deceleration in growth for a long time (Chand, 2008), and put food production on a new growth trajectory. The actual number of undernourished persons as reported by the FAO contradicts the models' projection of an increase in the number of hungry persons due to increase in food prices. According to the latest FAO publication, *The State of Food Insecurity in the World 2012* (FAO, 2012), the number of people undernourished in the world was 919 million during 1999-2001 which declined to 898 million in 2004-06 and 867 million during 2007-09 when food prices spiked (Appendix Table). These statistics on the number of undernourished persons do not hold up as to what was so strongly asserted by the organisations like FAO, WFP and World Bank on the effect of increase in food prices on hunger.

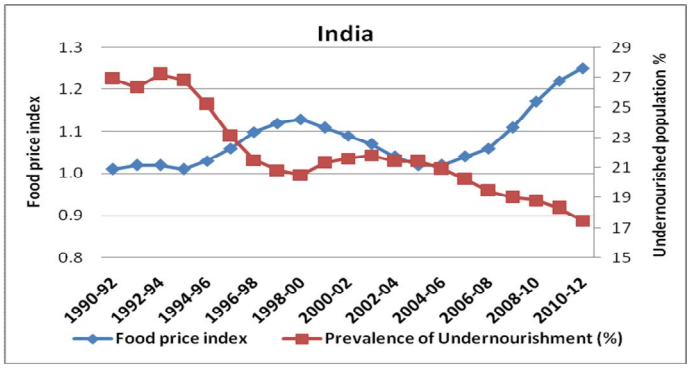
Changes in food prices and prevalence of hunger at global level and in India are depicted in Figures 1 and 2 for the last two decades. At the global level, the world index of food prices declined during 1993-95 to 2000-02 and then increased continuously up until 2010-12. Incidence of global hunger during the same period, i.e., 1993-95 to 2000-2002 declined from 17.2 per cent to 14.9 per cent and thereafter it continuously declined and reached 12.5 per cent in 2010-12, despite a sharp increase in real food prices. The picture is clearer at the national level and it shows three phases of price variations. The first phase from 1993-95 to 1998-2000, when real food prices in India increased, second phase from 1998-2000 to 2004-06 when real food prices declined, and, the final and third phase after 2004-06 when the real food prices increased substantially. The proportion of hungry population in total population as reported by the FAO based on its norm of 1800 Kcal declined from 26.8 per cent to 20.5 per cent in the first phase, i.e., when real food prices increased in India; it increased slightly in the second phase, i.e., when real food prices fell, and declined again from 20.9 per cent to 17.5 per cent between 2004-06 and 2010-12 when real food prices increased sharply. These patterns at the global and national

levels contradict the model-based findings, which are taken at their face value, always showing negative association between food prices and food and nutrition security. The empirical evidence presented in Figures 1 and 2 call for a relook into the effect of food prices on food security taking into account both direct as well as indirect effect of prices.



Source: Appendix Table

Figure 1: World Food Price Index and Global Hunger (per cent), 1990 to 2012



Source: Appendix Table

Figure 2.India's Real Food Price Index and Hunger (per cent), 1990 to 2012

V

CRITIQUE OF FAO NORM

Next, we discuss the FAO approach being used globally to gauge the levels of undernourishment. The FAO indicator follows a parametric approach and is expressed as the share of people in a national population that are not meeting their minimum food energy requirements. It is based on three critical parameters: the mean quantity of calories available in a country for human consumption, inequality in

access to those calorie intakes and mean minimum age-sex specific calorie requirements of that population. The FAO estimates the first parameter based on FAO country Food Balance Sheets (FBS) which is compiled as the balancing item after taking production, trade, stock changes, non-food uses and extra household waste into consideration. Based on this, the food quantity is converted into calories using the food conversion tables and divided by the total population to arrive at the per capita dietary energy supply (DES). Next, the inequality in access to these calories is computed using the DES and coefficient of variation (CV). The distribution of calories in the population is estimated by calculating the CV of energy expenditure and assuming a log normal distribution of energy consumption. The aggregated MDER is computed as the amount of food energy needed to maintain an acceptable minimum body weight, body composition and a minimum physical (sedentary) activity level. The FAO has been publishing this indicator annually as a 3-year average in its SOFI publications to apprise the global community about the levels and trends of undernourishment and assist in the global and regional food security governance. The FAO also in an attempt to update and overhaul its methodology has incorporated some changes in SOFI 2012 with respect to revisions in the world population data, revised MDER using data from country-level demographic and health surveys and anthropometrics surveys, revised estimates of DES, introduced country-specific estimates of food losses at the retail distribution level. They also included improvements in the estimation methods such as the use of a skew-normal distribution, changes in the way the parameters involved are estimated etc. Further, they have also introduced a set of additional food security indicators like the relative dietary supply index, food price level index, share of food expenditure by the poor etc. But despite these changes in the FAO approach, it still suffers from some key non-remediable problems in the accurate assessment of food security. These include the fact that the FAO approach only focuses on dietary energy availability and its distribution ignoring all the other nutrients. It is based on the minimum activity levels which are too simplistic an assumption in developing countries where majority of the workforce is involved in moderate or heavy manual labour. This approach is also incapable of capturing the impact of short-term price and economic shocks whose frequencies have been increasing in the recent past. It is not capable to assess the nutritional status of households/individuals and identify them. Such a restriction will deter in the monitoring and targeting of interventions in any country.

Concerns have also been raised on the use of FBS data as it measures food availability rather than food consumed. Food availability turns out to be a poor predictor of other vital measures such as mortality and economic productivity. It is averaged over a period of 3 years and does not capture the seasonal variations. Our major concern about FAO estimate of undernutrition is use of FBS as food intake. Actual undernutrition estimated by the FAO methodology will be higher or lower depending upon whether food intake is higher or lower than availability estimated

from FBS. To substantiate this point we take the case of India. FBS of FAO treats 89.6 per cent of cereals supply in the country as food intake. Thus, 10.4 per cent of total production of cereals is considered to be used for non-food purposes like feed, seed, wastage and industrial use. This coefficient of 10.4 per cent is fixed for the last more than 50 years. According to literature, the proportion of cereals going for non-food purposes has been rising and is much higher than 10.4 per cent assumed by official estimate on net availability adopted by FAO. This is quite evident from the difference between our estimate of hunger based on FAO norm of 1800 Kcal per capita derived from NSSO data on consumption and incidence of hunger reported by FAO. According to FAO, 18.8 per cent of India's population was undernourished during 2008-10 (FAO, 2012), whereas, our estimate based on FAO norm (Table 2) reveals the undernourishment level to be at 34.2 per cent. We conclude that the FAO methodology underestimates hunger for all those countries wherein the use of food commodities for non-food purposes is underestimated, as is the case for India.

VI

PARADOX OF HUNGER AMIDST PLENTY

India's nutrition statistics have been creating a lot of puzzles when seen in the light of availability of food in the country and dietary changes taking place over time. Two common indicators of nutrition are calorie deficiency termed as undernutrition or hunger and protein deficiency termed as malnutrition. Cereals are the primary source of energy as they contribute about 60 per cent to energy intake in rural and 50 per cent in urban areas. NSSO data shows that the per capita cereal consumption in India is low and it has shown a decline over time. Such a scenario is not due to the non-availability of adequate cereals in India. India has remained a net exporter of cereals for over 10 years and its buffer stocks have also swelled. During 2009-10, India exported 5 MT of cereals which has increased to more than 12 MT during 2011-12. India is also a net exporter of food and it exports large quantities of livestock products. Recently, it has emerged as the number one meat exporter in the world. Thus, on one hand, stock of cereals in the country and export of cereals and other food products are rising, and on the other per capita cereal intake is not rising and the country is reported to suffer from widespread hunger. One could argue that this situation has been created by government intervention to keep cereal prices high, which result in large part of production going into government stock rather than going into the hands of consumers (Chand, 2005). While this is partly true, particularly in the case of low income categories, the incidence of lower intake of energy compared to the norm is found to be quite common even among the middle and high income categories for whom the affordability to buy cereals is not so important. Thus, there is a need to look beyond the availability issue to banish hunger from the country. In contrast to undernutrition, prevalence of malnourishment is certainly related to low availability of pulses in the country.

One reason for low calorie intake in India seems to be the lack of awareness of or willingness of consumers to raise energy intake. The second important factor, often ignored by the researchers, is the cultural dimension. Most Indians feel comfortable with less food than that needed to supply the normative level of energy. The lifestyle patterns for many is also such that digesting food containing say 2000 Kcal by a person involved in sedentary activity creates problem without some sort of exercise. Profligacy in food intake is also not part of India's tradition. Because of importance of such factors it is felt that dietary transition in India may not follow economic transition witnessed earlier in the developed world and in China more recently (Landy, 2009).

VII

CONCLUDING REMARKS

In terms of the adequacy indicator, it was observed that the calorie deficiency is higher for rural areas than the urban areas. The average intake levels of poor households were at levels even lower than the uniform norm of 1800 Kcal of FAO. Among the demographically and activity-wise adjusted calorie norms, the prevalence of undernourishment is higher in rural areas across all the income categories. More than half of the income poor population is calorie deficient in both rural and urban areas across all the choices of norms. Such a population can be termed to be suffering from 'involuntary hunger' as they do not have the necessary income resources to take care of the quantity aspect of their intakes. However, undernourishment exists among the non-poor categories even when evaluated using the low uniform norm approach of FAO. These individuals can be termed as suffering from 'voluntary hunger' as they have the necessary income resources but still they are not consuming – may be out of choice or due to other non-income factors. This requires further probing.

The protein adequacy of the study population paints a different picture than caloric adequacy. In this case, the average actual intakes were found to be higher than the required minimum intake levels both for rural and urban areas barring the urban poor. However, due to uneven distribution of consumption across households, close to 40 per cent population was found to be suffering from malnourishment or protein deficiency. It was also observed that the percentage of population with inadequate protein intakes was higher in urban households as compared to their rural counterparts.

High food prices are often blamed for raising hunger without reckoning indirect effect of prices on production. Empirical evidence shows that inverse relationship between food prices and hunger cannot be generalised and recent spikes in food prices have not caused any adverse effect on the prevalence of undernutrition – they have rather improved undernutrition through positive effect on food production.

A number of indicators are coexisting that are being used both by the policymakers and public at large to infer about the state of food security and

undernutrition at global, national, household and individual levels. Unfortunately, these different indicators do not reconcile with each other and are acting as a source of confusion. In terms of the brief appraisal of the FAO methodology, it was concluded that such an approach is bound to lead to erroneous conclusions as it deals with food availability rather than food intakes. It was expected, and was found to be the case for India, that the level of hunger will be an underestimate when the use of food commodities for non-food purposes is underestimated.

The paradox of hunger amidst plenty prevailing in India suggests that there are historical and cultural factors that make India a different case and need further research.

To conclude, improving only incomes is not a panacea for the undernourishment and malnourishment problem in India. There is a strong need to create awareness about adequate intake of energy and protein and bring attitudinal change to raise energy and protein intake and adopt lifestyle to digest higher energy and protein. The paper clearly brings out that income growth and elimination of poverty is a "necessary" but not a "sufficient" condition for reducing undernourishment and malnourishment in India.

NOTE

1. Food includes cereals, pulses, edible oil, sugar, fruits and vegetables, milk, meat, eggs and fish.
2. State-specific poverty lines show large variation. It was Rs. 632 for Madhya Pradesh and Rs.1016 for Nagaland for rural areas for 2009-10.

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APPENDIX TABLE

Movement in food prices and changes in the prevalence of undernourishment in India and World

Period	World food price index	Ratio of WPI of food articles to all commodities: India (2004-05=100)	Prevalence of undernourishment (per cent)	
			World	India
(1)	(2)	(3)	(4)	(5)
1990-92	1.35	1.01	18.6	26.9
1991-93	1.35	1.02	18.1	26.3
1992-94	1.36	1.02	17.7	27.2
1993-95	1.36	1.01	17.2	26.8
1994-96	1.36	1.03	16.6	25.2
1995-97	1.35	1.06	16.1	23.1
1996-98	1.34	1.1	15.7	21.5
1997-99	1.33	1.12	15.4	20.8
1998-00	1.32	1.13	15.1	20.5
1999-01	1.32	1.11	15	21.3
2000-02	1.31	1.09	14.9	21.6
2001-03	1.32	1.07	14.7	21.8
2002-04	1.32	1.04	14.4	21.4
2003-05	1.33	1.02	14.2	21.4
2004-06	1.34	1.02	13.8	20.9
2005-07	1.36	1.04	13.5	20.2
2006-08	1.38	1.06	13.1	19.4
2007-09	1.39	1.11	12.9	19
2008-10	1.40	1.17	12.8	18.8
2009-11	1.41	1.22	12.6	18.3
2010-12	1.43	1.25	12.5	17.5

Sources: 1. Food Security Indicators, FAO (http://www.fao.org/economic/ess/ess-fs/ess-fadata/en/).
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