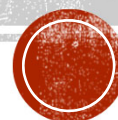


SDG2: ZERO HUNGER BY 2030! STATUS, ISSUES AND SOLUTIONS

Sivapuram Venkata Rama Krishna Prabhakar

Principal Policy Researcher, Water and Adaptation Group

Institute for Global Environmental Strategies, Hayama, Japan



IGES Podcast on SDG2, About Sustainability, the podcast is available at <https://www.iges.or.jp/en/projects/about-sustainability-podcast>.
Date: 09/08/2022

SDG2 IN BRIEF

- The SDG2 on Zero Hunger by 2030 aims at achieving complete eradication of hunger in all its forms.
- The SDG2 in specific focuses on the vulnerable populations such as women (pregnant and lactating), adolescent girls, children (especially those below 5 years old), and old persons.
- The goal includes 5 targets and 3 means of achieving the goal and targets.
- In essence, the goal covers the following broad areas:
 - Food security,
 - Nutrition,
 - Sustainable agriculture
 - Small scale farmers
 - Genetic diversity in food



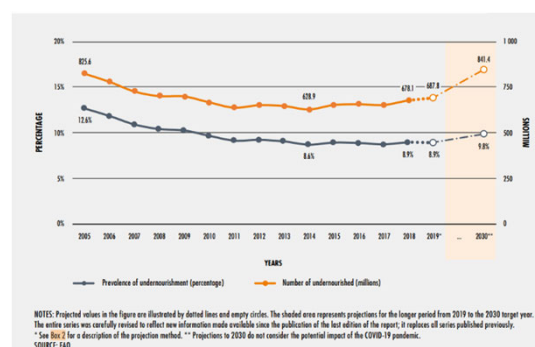
WHAT CAUSES HUNGER?

- Lack of food in the market, either due to droughts, floods.
- This was the situation in early 1930s to 1960s where some countries had to depend on the food imports to feed the nation as it happened for a brief period in the case of India that we call ship to mouth existence. PL480 assistance by US helped export wheat to India.
- Today, there is a food in the market but there is a lack of access to food since one cannot afford the food available in the market, either due to market failure, or supply chain failure (*externalities*) (Rocha, 2006).
- *This is where the poverty comes into picture. Both the rural and urban poor cannot afford food and urban poverty is much more serious since they cannot afford the food prices prevailing in urban areas.*
- *In 2021-22, India produced **316.06 million tonnes** of food grains (rice, wheat, coarse cereals, maize, pulses, gram etc.). This positive trend will have ameliorating affect on rural economy, food security, hunger and even the larger economy. A favourable monsoon rainfall is still a major factor in achieving these goals.*



TARGET 2.1 END HUNGER AND ENSURE ACCESS BY ALL PEOPLE TO SAFE, NUTRITIOUS AND SUFFICIENT FOOD ALL YEAR ROUND.

- Though the world made a progress in reducing the hunger, the undernourishment declined started to increase since 2015 due to a number of factors including conflicts, economic downturns, disasters including due to climate change.
- Currently, there are 828 million people in 2021.
- The COVID has added 150 million additional people to hunger population.
- As a result, FAO projections say that we may have 670 million people with hunger in 2030, the same number as in 2015.

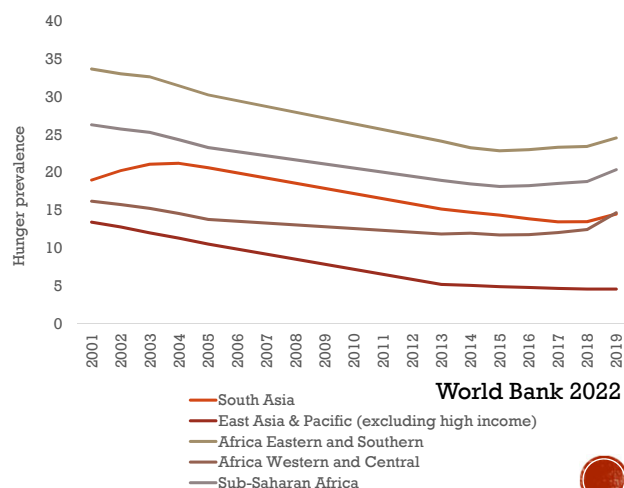


Kretschmer, 2020



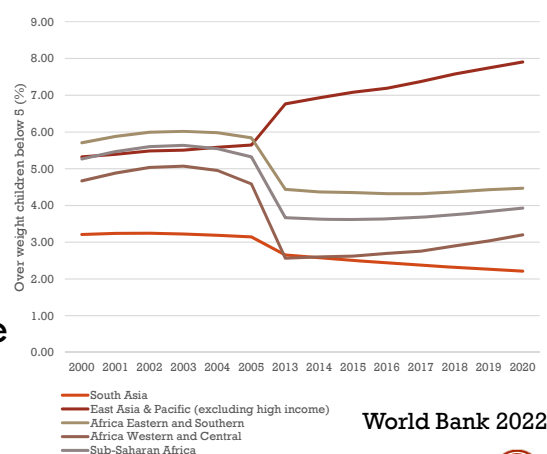
THE STATUS OF HUNGER PREVALENCE IN ASIA AND AFRICA

- There are 381 million undernourished in Asia.
- In Africa, 250 million and this number is growing faster than anywhere else.
- IN terms of hunger prevalence (%), Eastern and Southern Africa has the highest followed by sub-Saharan Africa and south Asia. East Asia and Pacific are doing much better comparatively.



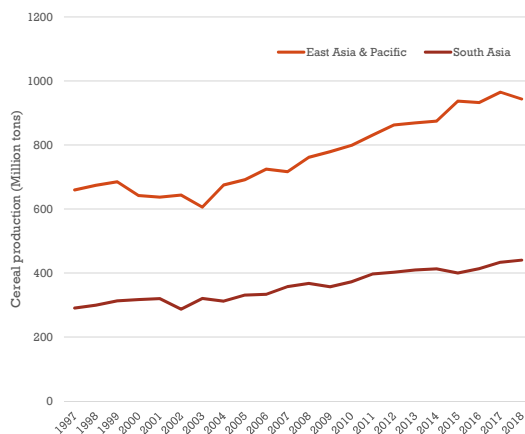
TARGET 2.2 END ALL FORMS OF MALNUTRITION AND ADDRESS THE NUTRITIONAL NEEDS OF ADOLESCENT GIRLS, PREGNANT AND LACTATING WOMEN AND OLDER PERSONS.

- Globally, 34.4% children are malnourished
 - 22% children under 5 are stunted,
 - 6.7% children wasted,
 - 5.7% children are overweight
- i.e. nutritionally healthy children are only 65.6%
- On the other extreme, children in East Asia and Pacific in specific are showing higher incidence of over weight.



2.3 DOUBLE THE AGRICULTURAL PRODUCTIVITY AND INCOMES OF SMALL-SCALE FOOD PRODUCERS

- In order to achieve this goal, there is a need for change in technologies, resource use efficiency and scale up these to reach the last mile of farmers who have not been touched by these advances so far.
- Overall, Southeast Asia achieved a more stable and sustained agricultural growth as compared to south Asia (Graph on the right).
- Human capital, level of urbanization, and development flow to agriculture positively influenced agricultural TFP growth (Liu et al., 2020).
- However, there is a gap. The GDP is growing by 5.5 in SA and 6.3% in SEA but agriculture growth is only 3.2% during 2003–2016.
- The share of agriculture in GDP is shrinking over time as well (22% in 2003 to 19% in 2016)
- However, the share of population dependent on agriculture is not changing much (47% in SA and 39% in SEA).



ARE WE REWARDING THE FOOD SELF-SUFFICIENCY OF COUNTRIES?

- Continued economic growth means more demand for food domestically and internationally
- Moreover, countries in the region have very aspiring agriculture export ambitions. For example Thailand and Vietnam wants to be rice bowl of Asia and even the world while Indonesia is striving to become food self-sufficient while not affecting its fragile ecosystems.
- Global food security index:
 - A skewed means of assessing food security as rich countries which import food are ranked higher than countries that export food or are food self-sufficient, giving more weightage to the ability to purchase food even if it is an important factor in food security.
 - This also means that developing countries should prioritize food access to their own population than focusing on food export.



TARGETS...

- **2.4** By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
 - Governments are continuously putting efforts to improve the sustainability of agriculture and increase productivity which tends to be a conflicting objectives in the current techno-social scenario. However, the scaling up of current efforts can help achieve this target especially with climate change adaptation joining the forces.
- **2.5** By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.
 - The erosion of genetic diversity in the current food systems is a real cause of concern. Developing gene banks is good but the actual development of crops and crop varieties with wider gene base is yet to shape the agriculture landscape. While doing this, respecting farmers' rights to use seeds and enabling private companies to recognize the farmer rights is a major issue to be overcome.



2.B CORRECT AND PREVENT TRADE RESTRICTIONS AND DISTORTIONS IN WORLD AGRICULTURAL MARKETS, INCLUDING THROUGH THE PARALLEL ELIMINATION OF ALL FORMS OF AGRICULTURAL EXPORT SUBSIDIES AND ALL EXPORT MEASURES WITH EQUIVALENT EFFECT, IN ACCORDANCE WITH THE MANDATE OF THE DOHA DEVELOPMENT ROUND.

- Global food trade is highly skewed and designed towards the benefit of few players and as a result the role of WTO in providing a level playing field has largely been questioned.
- While developing countries have developmental and food security needs, there is an undue burden on them to phase out subsidies sooner than they can improve the capacity of their farming community. This puts them in a conflicting situation.
- Even within a country, there is a wide variation in the capacity of farmers to produce high quality produce even for the domestic market. With the evolution of chain stores and entry of corporations, the livelihoods of small petty traders is also at risk.
- Capacity of many developing countries to meet the global competition in agricultural exports needs to be improved in the quality and quantity areas, developing strategies to enter into niche markets, and developing appropriate branding etc. is necessary.



2.C ENSURE PROPER FUNCTIONING OF FOOD COMMODITY MARKETS AND THEIR DERIVATIVES AND FACILITATE TIMELY ACCESS TO MARKET INFORMATION, INCLUDING ON FOOD RESERVES, IN ORDER TO HELP LIMIT EXTREME FOOD PRICE VOLATILITY.

- Global food markets are highly skewed and designed towards the benefit of developed countries than developing countries.
- While developing countries have economic and sustainable development needs, the development of food markets is largely not satisfactory.
- In absence of instruments such as future markets and futures contracts, farmers in the region are highly exposed to price volatility.
- Even when governments want to introduce policies that strengthen their ability to negotiate with stronger players such as private companies, these policies are often not encouraged due to skewed political opposition as happened recently in India.
- There is a need to strengthen farmer cooperatives and farmer producer organizations so that their voice and ability to access better markets is improved.
- Improving consumer-producer linkages can rekindle the trust and provide better price premiums thorough better understanding of needs and better produce.
- The improvement in the storage of farm produce still needs to see a growth in the region and the private sector can play an important role here through PPP and other models.



CAN WE ACHIEVE ZERO HUNGER BY 2030?

- “Around the world, more than enough food is produced to feed the global population” (Action against hunger, 2022)
- The world is not on track to achieve Zero Hunger by 2030.
- “If recent trends continue, the number of people affected by hunger would surpass 840 million by 2030.” (FAO, 2022)
- More recently, due to COVID19, the number of people affected by hunger rose to 828 million in 2021 itself. UN2021
- The Ukraine war has further exacerbated the food security impacts of COVID19 and the compound impact of both these global events has resulted in political instability in some countries (as seen in the case of Sri Lanka).
- The rise of global food prices is a major fallout of these global events and has put untenable burden on governments.



THE DEBATE ON INTENSIVE VS EXTENSIVE AGRICULTURE

- What we have been practicing for ages was intensification of agriculture, i.e. whenever we needed more food so we continued to expand the agricultural land.
- This approach has its own disadvantages such as negative impact on the environment through deforestation and competition for land from other activities such as urbanization, industrialization etc.
- Recognizing the competing uses of land, and as agriculture can no more expand exponentially or forever, the emphasis on intensive agriculture has come into fore. However, this was not a conscious decision more due to the need to produce food through Green Revolution during late 1950s and early 1960s.
- Green revolution has resulted in great increase in the productivity of rice and wheat crops with introduction of input responsive crop varieties and ensured food security for the millions.
- Now that we have sufficient food to feed, it is time to revisit our approach to increasing the food production and adopt more environmentally sustainable means.



RECOGNIZE LINKAGES BETWEEN SDG2 AND OTHER SDGS

- The Hunger goal is strongly linked with several other SDGs
 - SDG 1 i.e. Poverty eradication as it determines the access to food, and poverty is largely defined by the ability to buy food and other needs.
 - SDG 5 i.e. Gender equality since women play an important role in agriculture, it is about creating equal opportunity for women and about enabling women decision making within agriculture. Though nearly 60% of human labour is contributed by women in agriculture, the decision making is largely male-driven. So we need to make sure that women has property rights to land, access to resources, education and especially training in agriculture.
 - SDG 8 Decent work and economic growth.
 - SDG12: Food loss and resource use efficiency
 - SDG 13 Climate action: Climate change impact on food production is a major cause and provide opportunity to diversify food preferences with climate change concern.
 - SDG 14 Life below water: Meet the hunger while not negatively affecting the fishery resources and water resources in general since agriculture pollutes water bodies as well
 - SDG 15 Life on land sustainable territorial ecosystems, forests, biodiversity, sustainable management of forests, combating desertification etc.



ARE FERTILIZERS CRUCIAL IN MEETING HUNGER GOAL?

- **Major N fertilizers** are either in Ammonia form or in Nitrate form. Ammonia is naturally available (either lightening process or fixed by bacteria). But for the large-scale agriculture, ammonia is produced by Haber-Bosch process.
 - The Haber-Bosch process that **combines nitrogen with hydrogen to produce ammonia**. Developed in the early 1900s by Fritz Haber and modified to an industrial process to make fertilizers by Carl Bosch.
- Urea is the single largest ammonia fertilizer, produced by India, Russia, Indonesia, Pakistan in that order. Natural gas has high H content and hence countries depend on natural gas imports.
- Globally, 200 million tonnes of ammonia is produced annually, 20% by china
- The process requires energy which usually comes from **fossil fuels. $30\text{--}35 \text{ GJ t}_{\text{NH}_3}^{-1}$, 8 times more energy intensive than DAP production.**
- Ammonia production accounts for 1%–2% of global energy consumption and 1.44% of CO_2 emissions.
- Ammonia is in turn an input for making ammonium nitrate fertilizers (ammonia and nitric acid, nitric acid is made from combustion of ammonia or by reaction of nitrogen dioxide with water)
- Conventional Haber-Bosch plants produce NH_4 by using natural gas (50%), oil (31%) or coal (19%). There is a need to improve the efficiency and reduce the GHG emissions from this process by reducing the fossil fuel use for e.g. by using electricity instead of fossil fuels (Smith et al 2020).

PHOSPHORUS FERTILIZERS AND HUNGER

- Diammonium Phosphate (DAP), Monoammonium Phosphate (MAP) and Single Super Phosphate (SSP) are the major phosphorus fertilizers used in agriculture.
- Most phosphorous fertilizers are produced from phosphate rock, coming from China, USA, Morocco, Russia, Jordan etc.
- Phosphate rock is reacted with acid to produce soluble p fertilizer. If H_2SO_4 is used then single super phosphate is produced.
- DAP is made from the reaction of phosphoric acid (produced from mined phosphate rock) with ammonia. Most phosphoric acid in the world (80%) is produced from wet process of mixing Phosphate rock with sulfuric acid.
- Globally , DAP is produced 35.6 million tons and 7.28 million tons of MAP
- Again an energy intensive process. **4.95 GJ per ton of DAP.**
- DAP has 18% N and 46% P while MAP has 11% N and 52% P. However, DAP is used for slightly neutral to acidic soils while MAP is used for more alkaline soils due to their dissolution at different pH.

POTASSIUM FERTILIZERS AND HUNGER

- World soils are traditionally sufficient in potassium. However, the potassium demand is growing globally showing the depleting natural potassium content of soils due to over cropping and imbalanced fertilization.
- Potassium chloride (33-50% K) and potassium sulphate (43%) are two major K fertilizers.
- K_2SO_4 is produced by reacting KCl with sulfuric acid.
- Naturally soils have minerals such as feldspars (particularly orthoclase) and micas they release K over the years by natural weathering. However, the natural K availability is rapidly depleted due to over-cropping or due to rapid weathering and leaching, it requires addition of K from fertilizers.
- Global production capacity of potash (K_2CO_3) is 61 million tons per annum, Canada 1st, Belarus 2nd and Russia 3rd. Potash has to be mined and it can't be produced industrially. Potash is used to produce KCl, and KCl is reacted with Na or Ammonium NO_3 to produce KNO_3 .



FARM ENERGY DEMAND TO MEET THE HUNGER DEMAND

- Photosynthetic efficiency of C3 is higher than C4 plants. How to maximize their productivity has been a major area of work in agriculture research especially in the context of climate change.
 - C3 is 0.118 J per J of PAR
 - C4 is 0.114 J per J of PAR
- Off-farm energy inputs for making fertilizers, pesticides, tillage, sowing, harvesting, spraying chemicals, irrigation, post-harvest operations, transportation to the market etc.
- On-farm energy inputs: human labour, animal labour etc.
- In the past: largely positive when traditional agriculture was practiced, the ratio could be in the range of 2-3 as the traditional agriculture is non-energy intensive.
- Today, it is in the range of 1.5 or even sometimes less than 1 depending on the crop and produce of interest as in the case of Turkey
 - Cotton input 29 GJ/ha and output is 56 GJ/ha = 1.93 (ferti, fuel)
 - Rice input 39 GJ/ha output 60 GJ/ha = 1.53 (fertilizers)
 - Sugarcane input 148.02 GJ/ha output 112.22 GJ = 0.76 (irrigation)
 - (Gasoline 31.5 MJ/litre, Diesel 38 MJ/liter)



FOOD PRODUCTION HAS BEEN LARGELY ENERGY-BLIND!

- For ages, industrial or agriculture production we see only capital, land and human labour as inputs to production while we ignored energy as an important input to it. This energy blindness has led us to depend on an input.
- Even today, we are looking to produce more and more energy than reducing the energy dependency. This trend may continue and our energy dependency will increase multiple folds.
- Now, in agriculture, what are we really saying that what component of energy input can we reduce rather than what is not really contributing to final output. So, it is about looking for alternative energy sources and non-energy intensive processes.
- The application of renewable energy (RE) has huge potential in agriculture especially in tillage and harvesting operations that are not yet reached by RE. The current RE focus has been largely in pumping and lighting needs of the farms.



HOW TO REDUCE COVID IMPACT ON HUNGER?

- Meet the immediate food needs of vulnerable populations:
 - Food provisioning through governments and NGOs has been significant.
- Implement and boost social protection programmes:
 - Are very poorly developed in developing countries. But now countries are improving slowly for example we see that countries are introducing direct benefit transfer schemes that has direct impact on the poverty as well as purchasing power of food and other essential goods and services
- Sustain the global food trade
 - An important limitation as of now since global supply chains are disrupted. Additional burden of Ukraine war.
- Strengthen the domestic supply chains:
 - This requires more local production, and supporting local farmers
- Support smallholder farmers' ability to increase food production.
 - Institutional support through bank loans, capacity building, new affordable technologies etc.



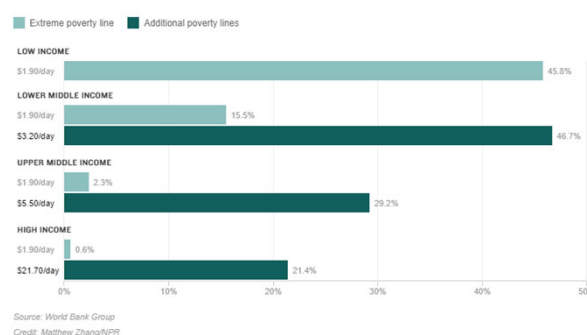
HUNGER, FOOD SECURITY AND POVERTY

- **Food security:** United Nations' Committee on World Food Security all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.
- World Bank defines extreme poverty as living on less than \$1.90 a day, measured in 2011 purchasing power parity prices.
- Since all people below 1.9 USD cannot be treated equally, the World Bank has developed the 'poverty gap index' as an alternative way of measuring poverty that measures the intensity of poverty, by calculating the amount of money required by a poor household in order to reach the poverty line.



POVERTY AND HUNGER ARE RELATED POVERTY LINE: INTERNATIONAL

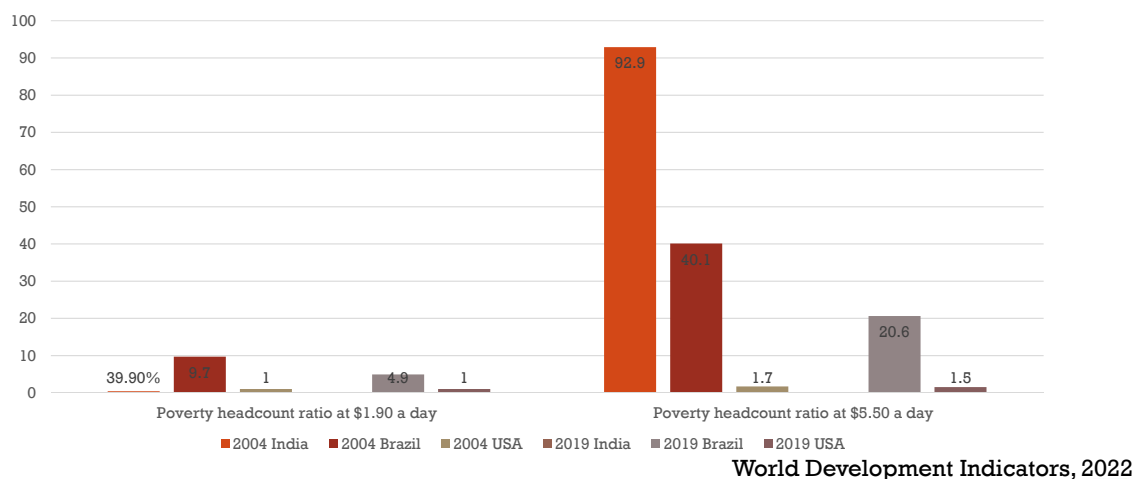
- Poverty lines aren't the same in all countries. In higher-income countries, the cost of living is higher and so the poverty line is higher, too. In 2017, [the World Bank announced](#) new median poverty lines, grouping countries into low-income, middle-income, and high-income countries:
- \$1.90 per person per day — in 33 low-income countries
- \$3.20 per person per day — in 32 lower-middle-income countries, such as India and the Philippines
- \$5.50 per person per day — in 32 upper-middle-income countries, such as Brazil and South Africa
- \$21.70 per person per day — in 29 high-income countries



World Bank, 2022



POVERTY IN INDIA, BRAZIL AND USA (COMPARING FOR 2004 FOR WHICH THE DATA IS AVAILABLE FOR INDIA)



ABSOLUTE POVERTY VS RELATIVE POVERTY

- Absolute poverty is the condition where the daily income is insufficient to afford basic necessities of life (such as shelter, food, clothing etc.).
- Relative poverty is a comparative in nature i.e. level of income that is below the 50% of the average median income of the population.
- While in India the absolute poverty is declining, the relative poverty is increasing. India still follows the absolute poverty method while most countries have moved to relative poverty estimations.

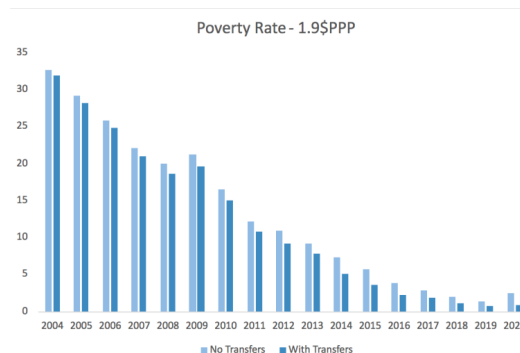


Figure 1. The poverty rate in India (Bhalla et al 2022)

FOOD SUBSIDIES AND POVERTY

- “By our estimates, in the pre-pandemic year 2019, extreme poverty was already below 1 percent and despite the significant economic recession in India in 2020, we believe that the impact on poverty was small. This is because we estimate poverty (HCR) after incorporating the benefits of in-kind food (wheat and rice) subsidies for approximately 800 million individuals (75 percent of rural and 50 percent of urban residents). This food subsidy was not small and rose to close to 14 percent of the poverty line for the average subsidy recipient (Figure on the right) in 2020. This was enough to contain any rise in poverty even in the pandemic year 2020.” (Bhalla et al 2022)

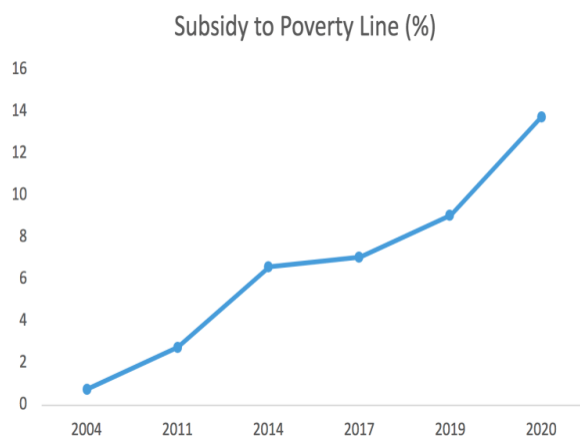
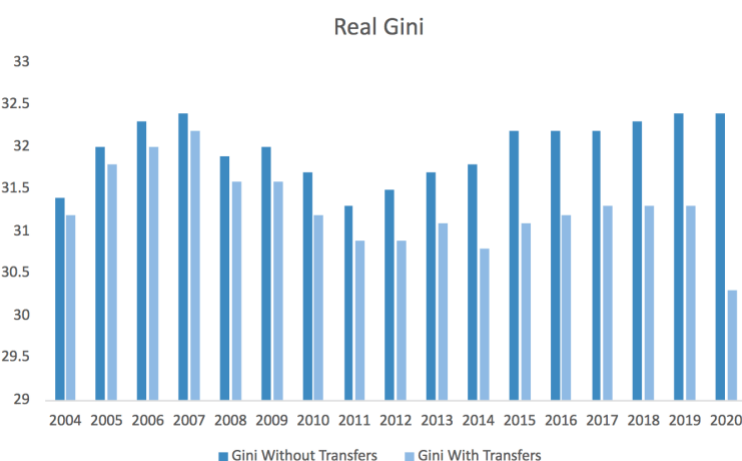


Figure 2. Food subsidies contained any increases in poverty (Bhalla et al 2022)



CONSUMPTION INEQUALITY

- Consumption inequality is lower than income inequality, which itself is lower than wealth inequality.
- Consumption inequality declined due to government transfers.
- All the estimates are made in the absence of an official survey post-2011-12. The 2011-12 values are based on the Tendulkar poverty line method.



(Bhalla et al 2022)



POVERTY MEASUREMENTS IN INDIA

- The poverty ratio in India has been measured from an exogenously determined poverty line quantified in terms of per capita consumption expenditure over a month and the class distribution of persons obtained from the large sample survey of consumer expenditure data of the National Sample Survey Office.
- Consumer Expenditure Survey is done by NSSO every five years.
- Dandekar and Rath (1971) suggested the use of 2250 calories per day for calculating consumption expenditure in rural and urban areas.
- Dr. Y. K. Alagh task force (1979) used 2400 Kcal per day norm for rural and 2100 kcal per day for urban areas.
- Rangrajan Committee (2014) suggested rural urban and state level poverty lines

Gaur and Rao, 2020



WHY EXPENDITURE APPROACH AS AGAINST INCOME APPROACH?

- Poverty line estimation in India has been based on the consumption expenditure and not on the income levels due to difficulties in
 - assessing incomes of self-employed people, daily wage laborers etc,
 - large fluctuations in income due to seasonal factors, and additional side incomes
 - data collection difficulties in largely rural and informal areas
 - households access credit markets or savings and smooth their consumptions
- Poverty is multidimensional and including consumption based estimates of food requirements alone will not capture the poverty (e.g. health, education, transportation, energy etc). Till date, no suggestions have been able to propose a multi-dimensional poverty estimation methodology.
- Further, malnourishment and poverty numbers may not match with each other as some states have higher malnourishment than poverty (e.g. AP, Assam, J&K).
- Based on Saxena Committee's recommendations, in 2011, the MoRD launched the Socio-Economic and Caste Census (SECC) suggested a graded multi-indicator based approach to fix BPL families. Many government programs implemented from 2014 onwards used this criteria.

Gaur and Rao, 2020



NEED TO MOVE TO MULTI-DIMENSIONAL POVERTY MEASUREMENTS FOR EFFECTIVE HUNGER REDUCTION

- UNDP and the Oxford Poverty and Human Development Initiative (OPHI) suggested a multi-dimensional poverty index that includes health, education and living standard with 1/3rd weightage each in the final index.
- A person is **multi-dimensionally poor** if she/he is deprived in one third or more (means 33% or more) of the weighted ten indicators.
- Those who are deprived in one half or more of the weighted indicators are considered living in **extreme multidimensional poverty**.
- NITI Aayog has constituted a Multidimensional Poverty Index Coordination Committee (MPICC) with members from relevant Line Ministries and Departments.
- In India's MPI, nutrition receives 1/6 weightage.



THE NATIONAL FOOD SECURITY ACT (2013) OF INDIA

- The national food security act (2013) takes food security as a rights based approach as against welfare based approach.
- 80 crore persons have been covered under NFSA at present for receiving highly subsidized food grains
- The act provides 75% of rural population and 50% of urban population subsidized food grains under the targeted public distribution system (TPDS)
- Pregnant women, lactating women, and children 6 months to 14 years are included who receives free food through integrated child development service centres (ICDS) (Also called Anganwadi centers), and school midday meal programs. Lactating and pregnant women also receive INR 6000 as a compensation for loss of income during the period and for nutrition. The food grains are provided at fair price shops (FPS). Center provides the food grains while the distribution and implementation and issuing cards is the state government responsibilities.
- NSS household consumption survey data 2011-12 is used for this.



DIRECT CASH/BENEFIT TRANSFER UNDER NFSA

▪ Cash Transfer of Food Subsidy Rule, 2015

- (i) Reduce the need for huge physical movement of food grains
- (ii) Provide greater autonomy to beneficiaries to choose their consumption basket
- (iii) Enhance dietary diversity
- (iv) Reduce leakages
- (v) Facilitate better targeting
- (vi) Promote financial inclusion
- Implemented in UTs of Chandigarh and Puducherry from September, 2015 and some areas of Dadra & Nagar Haveli from March, 2016. Other states and UTs it is limited to specific regions in consultation with respective govts.

Government of India, 2022



CAN WE FEED BILLIONS BY 2050?

1. Produce more food without harming the environment
 - Climate smart agriculture
 - Sustainable agriculture
 - Organic agriculture
 - Following best management practices
2. Reduce food wastage
 - A 30% of world food is wasted every year (1.3 billion tons annually) UNEP
 - This wastage has both the development cost as well as environmental costs since a lot of inputs are used in producing food.
 - China wastes 50 million tonnes of grain annually, accounting for 10% of the country's total grain output
 - India wastes 40 % of the food produce (FAO), ₹92,000 crores per annum, before reaching homes.
 - At homes, UNEP estimated that 50 kg of food is thrown away per person every year in Indian homes (Food Waste Index Report 2021)
 - Food waste has happened during pandemic as a lot of food either cannot be shifted to markets or stored or stored food couldn't be transported to the markets. India lost nearly 65 lakh tons of food in the first four months of 2020



CONT...

- Households can reduce the waste by purchasing only when needed, purchasing small portions, avoiding single use packages, refrigeration at home and at village level, using refrigerated transpiration as much as possible, trying to use all the parts of the meat as much as possible or processing the meat.
- No Food Waste: Coimbatore-based NGO aim to redistribute excess food to feed the needy and hungry
- Adrish ("mirror"): India's first chain of zero-waste concept stores
- Atsugi, Kanagawa "eco-money" a community currency waste is collected, composted for local farmers. issues the eco-money when people bring household food waste to "Eco Station," a drop-off site. Each kilogram of the waste is rewarded with ten points of eco-money, which can later be used as 10 yen.
- Hokkaido Food Self-Sufficiency Network is promoting local food of wheat and soybean from local producers supported from their membership fee.
- Second Harvest is a food bank in Japan that circulates waste food, reduce food waste and increase food security. receives donations from manufacturers, retailers, farmers and private individuals unexpired food. 3 components: Harvest Kitchen, Harvest Pantry, Food Banking.
- There are 6007 private soup kitchens established by individuals and agencies to feed children. They follow a mixed approach of food collection or preparation etc. and distribute to children.

HOW JAPAN IS HANDLING? "*MOTTAINAI*"

- 1 in 6 in Japan are facing relative poverty (20 million).
- Japan's food self sufficiency is 39% in terms of calories in 2015
- Food waste is nearly 29% of the total food. Much of it goes to landfills (10 million tons) or incinerators. Out of 28 million Tons of wasted food, nearly 6 million tons is edible. Both food businesses and households waste equal amount of food.
- People mostly waste food due to freshness/mould, best before dates, food safety, and unfinished food
- Recycling loop system was introduced to convert waste food into feed and fertilizers
- Revisiting the mass production of processed food so that there is a high head time left for consumers to use the food and reduce the time of manufacturing since food products involve multi-stage production from the farm to factory to households. Hence, the one-third rule is being revised so that food production is completed within 50% time of the food usage.

Masami Hori, Tokyo Metropolitan Government

CAN WE FEED BILLIONS BY 2050? CONT...

3. Reduce disaster impacts and related crop losses
 - Crop calendar adjustments
 - Crop varieties (drought and flood tolerant varieties)
 - Climate-smart agriculture and identify new opportunities
4. Reduce Pest damage
 - Crop varieties, better management practices, eco-friendly pest management with less reliance on pesticides
5. Improve the nutrition of food
 - Breeding for nutrition as against breeding for quantity
 - Bio-fortification of food with nutrients (Vitamin A Fe are lost as many depend on carbohydrate rich food) including through application of genetic engineering in developing new and improved food crops and by enhancing the genetic diversification in agriculture.



CAN WE FEED BILLIONS BY 2050? CONT...

- Technological and socio-cultural U-turn
- Currently, agriculture in many regions is using too much water, land, or fertilizer
- Agriculture yields are very low in many part of the world and here we can increase the productivity without harming the environment
- Areas where the TFP is diminishing: here we can improve the efficiency of inputs, through technology, and change the cropping patterns.
- Change in food consumption patterns: Move away from animal proteins to plant proteins and related alternatives.



WHERE DO WE GO FROM HERE?

- **SDGs needs to be ambitious?** Not true in case of SDG2, going by where we stand today, the zero hunger goal is a mammoth task ahead of most countries.
- **Food trade is a very big issue:** Developing countries feel like they are stuck between two competing and conflicting priorities as they have to reduce food subsidies while achieving the hunger which is a very difficult proposition and in terms of time scale they have at hand.
- **Data** is the biggest problem in SDG2. A lot of data comes on a time scales that are much slower than the pace with which countries need to target.
- Finally, **Inequality** is the biggest problem, economic and social, and transformational changes are required in it at the larger political, social, economic governance level.



THANK YOU!

Please refer to our work here:

